1259 c 16

THE
YOUNG PAINTER's
MAULSTICK;

BEING
A PRACTICAL TREATISE ON

PERSPECTIVE;

CONTAINING
RULES AND PRINCIPLES
FOR
DELINEATION ON PLANES,

Treated ſo as to render the Art of Drawing correctly, eaſy of Attainment even to common Capacities; and entertaining at the ſame Time, from its Truth and Facility. Founded on the clear mechanical Proceſs of

VIGNOLA AND SIRIGATTI;
UNITED WITH THE THEORETIC PRINCIPLES OF THE CELEBRATED
DR. BROOK TAYLOR.

ADDRESSED
TO STUDENTS IN DRAWING.

BY JAMES MALTON,
ARCHITECT AND DRAFTSMAN.

K.

That not in fancy's maize he wander'd long,
But ſtoop'd to truth and moraliz'd his ſong. **Pope.**

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1800.

BRITISH MUSEUM

TO

BENJAMIN WEST, ESQ;

President

OF THE

ROYAL BRITISH ACADEMY FOR PAINTING,

AND TO THE

ACADEMICIANS and ASSOCIATES

OF THAT

INSTITUTION,

This Work

IS RESPECTFULLY DEDICATED,

With hope that it may be approved by them and eſteemed deſerving of being recommended to the Attention
of the Students under their Care;

BY THEIR HUMBLE SERVANT,

JAMES MALTON.

APOLOGY.

DESIROUS to avoid every charge of preſumption, for preſenting a work on Perſpective to the public, while ſo many are extant, and during the lifetime of my father Mr. Thomas Malton, ſen. who has himſelf ſent into the world ſo extenſive and ſo excellent a treatiſe on the ſame ſubject; I deem it but proper to urge a few reaſons which actuated me to add another to the number, in vindication of myſelf, ſhould any be inclined to cenſure me for having ſo done.

I had long heard it advanced, and by perſons poſſeſſing the works of the beſt informed writers on this head, not excepting even that by my father, that there yet was wanting a practical treatiſe, which would exemplify the doctrine of delineation, in an eaſy, familiar, and engaging manner; and wherein its rules might be applied to pleaſing and painter-like ſubjects. I could not but admit the juſtneſs of ſuch remarks, nor deny that I had obſerved the ſame, and had very early in life felt a ſtrong inclination to be myſelf the perſon who ſhould ſupply that deſideratum.

My acquaintance with the ſubject, according to the elegant principles of Brook Taylor, and my having made frequent, but ineffectual, endeavours to teach it on thoſe principles, and make it engaging at the ſame time, reduced me to the neceſſity of adopting the method of practice that is followed throughout this work, which is a mixture of the ſcientific principles of Brook Taylor, with the clear mechanical mode of Vignola and Sirigatti; making a moſt pleaſing, facile, and entertaining, union; the correctneſs and diſpatch of which manner of delineation is admitted by my father, and ſlightly treated on by him in the appendix to his valuable work.

Independent of the want of an agreeable method of procedure, the figures whereon the generality of authors on Perſpective have employed their rules, have, very feebly, conveyed poſitive information, being, by much the greater part, ill conceived, and rather diſguſting, in lieu of being inviting. The voluminous prolixity of ſome, obſcure brevity of others, trifling littleneſs of many, and partial application of moſt of them, have neither rendered the ſubject intereſting, nor given general information. Some have been purely mathematical, others wholly mechanical, and few, or none, ſeem to have made due reference to the painter. I hope that I ſhall be found to have proceeded otherwiſe. By nature I was better gifted with the talent requiſite for a painter, than for a mathematician; yet I delighted in the purſuits of both, and was capable at the age of fourteen, to demonſtrate any problem in the twelfth book of Euclid, of delineating any regular piece of architecture in perſpective, of taking a correct draft from a plaſter caſt of the human figure, of drawing any of the five orders of architecture, or of copying a landſcape of Barratt, or of Gainſborough. This, it will be obſerved, I advance not with a view of boaſting of what I was, or am, capable of performing, but to inſtance the likelihood there is, that this work will be found leſs tediouſly dry, than thoſe of my predeceſſors on the ſame ſubject.

The inclination I entertained, I was earneſtly encouraged to the performance of, by perſons who judged me competent to the taſk, ſome of whom I had the honor to inſtruct in the art. For ten years paſt I have been occaſionally engaged preparing the ſubject matter, from my own knowledge of the art, obſervations from great practice, and remarks from the obſervations of others, (ariſing from imperfect knowledge, or erroneous conceptions concerning it,) and arranging and digeſting the whole that it might, as much as I could make it, be worthy to meet the maſter painter's eye, and engage the ſerious attention of the ſtudent.

It is not my intention to attempt to prove that the principles of procedure of this work, are the beſt that could be given; there being ſeveral ways to effect the ſame end, each may, probably with good reaſon, have its diſtinct admirers. It will be ſufficient for me to aſſure my readers that, from knowledge of theſe various ways, great practice, and experience in teaching, I have ever found mine moſt expeditious, certain, and eaſy of attainment. Should any be deſirous to fathom the ſubject to its depth, to gratify a laudable curioſity, they may obtain that ſatiſfaction, by looking into more elaborate works; as my Father's, Highmore's, or Hamilton's, or Brook Taylor's itſelf; but which labour it was my intention, by this work, to ſave thoſe whoſe deſire it is to obtain knowledge of the art on juſt principles, with as little trouble as poſſible; and with a view to acquire only that ſufficiency of it, as to enable them to project ordinary objects with truth and facility.

Throughout this work, I lay claim to as little favour as the gentle critic may be diſpoſed to allow me; I look upon myſelf as competent to the taſk I have undertaken, and am not above telling my readers, it has been a matter of twelve years leiſure conſideration; I hope for that indulgence only, which humanity ſhould ever allow to human frailties. I undertook it with the flattering hope of pleaſing all, but now publiſh it with great fear of not thoroughly ſatiſfying any. Knowledge of perſpective has been ſubject of great delight to me, and cannot but be a pleaſure and advantage to every artiſt. A grateful deſire to communicate that advantage to others has been throughout, a conſiderable motive to my executing this work; other reaſons will no doubt be laid to my account, and which I am by no means inclined to diſallow; but intereſt, I can ſafely aſſert in this caſe, yields place to more liberal motives.

Exclamation is but too ready to be made at the great bulk of works on perſpective, as alſo at their expence. It would be adviſeable for ſuch perſons to reſort to Brook Taylor, where they will have no reaſon to object to either of thoſe conſiderations. But fully to elucidate and exemplify that author's work, ſo as to render it clear to common capacities, would extend to a large folio volume or two, with numerous plates. That works on perſpective are bulky, ariſes from the earneſt deſire their authors have had thoroughly to inveſtigate the ſubject, that it might be fully underſtood by thoſe for whoſe advantage it was deſigned; bulk therefore ſhould not be cauſe of objection, what is ſuperfluous, to the diſcerning, may be paſſed over. Their expence is certainly ſtill leſs a matter of complaint, the moſt voluminous and expenſive of them, has ſeldom I believe, exceeded the ſum of three pounds. What would three pounds be towards purchaſing any good picture by a great maſter? which is often done by artiſts to examine minutely into their principles of colouring, compoſition, and the like. And is a knowledge of perſpective of leſs conſequence? A very ſenſible writer[a] obſerves, “Whatever ſome people may think, “a picture deſigned according to the rules of perſpective, and the principles of anatomy, will “ever be held in higher eſteem by good judges, than a picture ill drawn, let it be ever ſo “well coloured. For nature, though ſhe forms men of various colours and complexions, never “operates in their motions contrary to the mechanical principles of anatomy, nor, in exhibiting “theſe motions to the eye, againſt the geometrical laws of perſpective.” An artiſt, ſenſible of any want of knowledge of perſpective ſhould purchaſe and carefully examine every work on the ſubject that is publiſhed, until, from ſome one, or all, he gleaned every information requiſite.

Almoſt every late author on this ſubject has taken occaſion to obſerve, that there have been many treatiſes written on it, probably preſuming his would preclude the neceſſity of any other; but ſo far am I from intimating or imagining the ſame of mine, that I hope to ſee many ſucceed it, and ſhall eſteem myſelf happy in forming one ſtep to a ladder by means of which, ſome one, fortunately favoured, ſhall happily reach perfection, and compoſe a work moſt engaging to where it is moſt applicable, and that PAINTERS, not MATHEMATICIANS, ſhall evince to the world moſt acquaintance with perſpective.

[a] Count Algarotti, F. R. S. F. S. A.

PREFACE.

AT the preſent æra to enter on any eulogium on painting, or to endeavour to point out its advantages, either to a learned or commercial ſociety, would be, if not impertinent, at leaſt ſuperfluous. Facts that are perfectly eſtabliſhed, and which are of themſelves indiſputable, require not proof. To further the perfection of the art is all that is now required of its advocates: inſtances of its value, and of the great eſtimation which it has ever obtained in all poliſhed nations, from thoſe moſt able to appreciate its worth, are to be found innumerable. No one can reflect on its aid and influence in the fields of ſcience, or conſider how it enlarges the channels of manufacture and commerce, without being perfectly ſenſible of its importance: in an inſtant does it impart value to worthleſs materials, and, it may be ſaid, with god-like power, give to ſhapeleſs matter, form, life, and beauty! But the Arts themſelves, though the great ſource of wealth to manufactures, diſdain to be reduced to their level; they may exalt the humble trades of neceſſity, but will not float in the ſame ſtream; vain, very vain, muſt every attempt be to *manufacture* Pictures! Even the hand that executed the firſt production cannot produce an equal copy; the fire, the ſpirit, the energy, is gone. Painting is the ſource of the eye's delight, an elegant refiner of life; and inaſmuch as it is brought to perfection, is a nation refined, and does ſentiment and every virtuous feeling engender that enlarges the mind and expands the human heart.

More than any other art or ſcience, painting labours under diſadvantages, as to a certain road to acquirement. The advances of prior exploriſts avail but little the emulous enterprizing ſtudent, like a veſſel that proudly traverſes the ocean, the pride of art, and admiration of beholders, painting ſteers her ſtately courſe; the artiſt, who moſt excels, conducts the helm, but leaves ſmall traces behind to mark her way, or guide her anxious votary's purſuit.

The ſcience of optics, only, lends a conſiderable portion of certain advantage to painting, in that branch of it which relates to direct viſion. This aſſiſtance has not been overlooked, but much conſidered, and copiouſly treated on by numerous writers, under the head PERSPECTIVE. Perſpective gives infallible rules for delineation; it is the art of depicting objects on planes, ſo as truly to repreſent them as they appear. The very definition anticipates all that can be ſaid in its recommendation. Linear perſpective, as far as its effect extends, furniſhes a ſure and ſolid foundation to the art of delineation; but unfortunately, its utility has been inſufficiently regarded, and leſs eſteemed by thoſe to whom its information was of the utmoſt value; while its merits have been minutely inquired into, and its worth fully eſtabliſhed by others, to whom it could impart no practical advantage whatever. By the mathematicians it has long been engroſſed, they have induſtriouſly aſcertained the infallibility and extent of its powers, and from time to time have offered the matured child to its original parents, but indeed ſo obſcured by mathematical ſymbols, with *theſis*, *hypotheſis*, and *demonſtration*, as ſcarcely to be recognizable by them, and the painter-ſtudent is literally loſt "in the intricate mazes of the *liney* labyrinth." Artiſts however, ſenſible of their right and its advantages, ſhould again reſume it, diveſt it of its obſcurities, develop its beauties, and adapt it to their particular reſearches.

A genius for painting or for poetry, ſeems almoſt incompatible with profound ſkill in mathematical ſciences. There are, to be ſure, few general rules without exceptions; not that I know any in the preſent inſtance, but there may be both painters and poets deeply converſant with, and who delight in the mathematics; but this I am inclined to imagine, is by no means common. Reaſons for this diſunion of purſuits, and where one has ſome dependance on the other, are not however difficult to be aſſigned; the exerciſe of either of the two former faſcinating arts, being produced chiefly by a warm luxuriant imagination, is indignant of reſtraint; the fancy, prompt and eager to expreſs its impulſes, ſpurns thoſe trammels that would curb its impetuoſity, or retard its endeavours, rejecting the ſlow, but ſure advances of art.

The ſhorteſt, and only ſecure road to knowledge, leads through theory to practice; a neglect of which procedure, with regard to painting, is the cauſe of the many erroneous productions which with concern we too frequently witneſs: nor are ſuch errors leſſened when endeavoured to be palliated by the ſometimes admiſſible, but abuſed, term of licenſes. No one can properly be ſaid to have taken a licenſe but he who knows the boundaries of rule. Poets and Painters have their peculiar liberties moſt liberally granted them, and, uſed with diſcretion and judgment, they are ever admitted. He who proceeds licentiouſly, without inquiry, or guide, muſt not be ſurpriſed to meet the fate of Phæton. It may be ſaid I regard not the rigid trammels of preſcription; rule ſhall not confine me; my *genius* or my *will*, ſhall have its ſway; *laws* ſhall not conſtrain me: Then tell the rules tranſgreſſed? Make known the boundaries broken through? Aſſign reaſons for ſo doing? Unleſs that can be done, and juſt motives be advanced in extenuation, all is anarchy, licentiouſneſs, and breach of order. Active genius may not want the ſpur, but frequently ſtands in need of the curb.

Sir Joſhua Reynolds, in his firſt diſcourſe delivered to the Royal Academy, ſpeaking of the ſtudy and practice of painting in general, ſays, "Every opportunity ſhould be taken to diſcountenance that falſe and vulgar opinion, that rules "are the fetters of genius; they are fetters only to men of no genius; as that armour, which upon the ſtrong is an ornament and a defence, upon the weak "becomes a load, and cripples the body which it was made to protect. How "much liberty may be taken to break through thoſe rules, and, as the Poet expreſſes it, *To ſnatch a grace beyond the reach of art*, may be a ſubſequent conſideration, when the pupils become maſters themſelves. It is then, when their "genius has received its utmoſt improvement, that rules may poſſibly be diſpenſed "with. But let us not deſtroy the ſcaffold, until we have raiſed the building."

The modern Painters are leſs regardful of a knowledge of perſpective than were the ancients. By the ancients it was known and cultivated, and their diſcoveries and opinions of its conſequence in painting have been repeatedly handed down to us. By the moderns it is neglected and almoſt loſt; by many, more than neglected, more than loſt, ridiculed, and diſingenuouſly repreſented. 'Tis true there are ſome painters ingenious in perſpective, and who do earneſtly recommend the ſtudy of it; ſome in my knowledge and whom I could here mention, but for obvious reaſons: the ſame motives however do not withhold me reſpecting the late Sir Joſhua Reynolds, whoſe incomparable diſcourſes on painting in general are given complete, to an indebted world, by his friend Edward Malone, Eſq. and prove that Sir Joſhua's knowledge of perſpective as well as of painting was conſummate.

Rules and precepts have often been drawn up as guides to the young ſtudent in the art of painting. Few have been more conſidered, and in many reſpects moſt juſtly, than thoſe written in Latin verſe by Du Freſnoy[a]. They compoſe a work of much labour and learning, and of which there are ſeveral tranſlations into Engliſh; one by the celebrated Dryden, in proſe, but in a manner not much to his credit, the ſubject being, apparently, not well underſtood by him. A poetical tranſlation by Mr. Maſon,[a] is a maſterly performance, and what renders this production ſtill more valuable and complete, is its being accompanied with elucidatory notes by his friend Sir Joſhua Reynolds; in the courſe of which the ſubſtance of much important matter is unfolded with additional information.

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[a] A diſtinguiſhed French Artiſt, who died in 1665.

Among the many pertinent obſervations in this excellent Poem is one very exceptionable paſſage on perſpective; in which, the Author miſtaken himſelf, or probably not knowing, or not liking the ſubject, has moſt unjuſtly, and incorrectly remarked concerning that only *certain* aid to painting. As this Poem is deſervedly much read and in the hands of almoſt every ſtudent, it is but proper that ſuch unſound doctrine ſhould be expoſed. In Engliſh, by Mr. Maſon, the paſſage is as follows:

> " Yet deem not, Youths, that perſpective can give
> " Thoſe charms *complete* by which your works ſhall live;
> " What tho' her rules may to your hand impart
> " A quick *mechanic* ſubſtitute for *art*,
> " Yet *formal, geometric* ſhapes ſhe draws;
> " Hence the true *genius* ſcorns her *rigid* laws:
> " By *nature* taught he ſtrikes th' unerring lines,
> " Conſults his *eye*, and as he *ſees* deſigns."

Sir Joſhua's good judgment could not let ſuch a paſſage paſs without cenſure and amendment, which he has done in expreſs terms, but he might have ſaid much more, and it remains to be wiſhed he had given fuller ſcope to his remarks on the erroneous conception and dangerous tendency of theſe verſes. What he has ſaid is replete with the moſt accurate judgment, and is of great ſubſtance: " Freſnoy, he ſays, was not aware that he was arguing from the abuſe of the art " of Perſpective, the buſineſs of which is to repreſent objects as they appear to the " eye, or as they are delineated on a tranſparent plane placed between the ſpectator

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[a] Mr. Maſon, in an Introductory Preface to his tranſlation, addreſſed to Sir J. Reynolds, has theſe verſes on Dryden.

When DRYDEN, worn with ſickneſs, bow'd with years,
Was doom'd (my friend, let pity warm thy tears)
The galling pang of penury to feel,
For ill-plac'd loyalty, and courtly zeal,
To ſee that laurel, which his brows o'erſpread,
Tranſplanted droop on SHADWELL's barren head,
The bard oppreſs'd, yet not ſubdu'd by fate,
For very bread deſcended to tranſlate:
And he, whoſe fancy, copious as his phraſe,
Could light at will expreſſion's brighteſt blaze,
On FRESNOY's lay employed his ſtudious hour;
But niggard there of that melodious pow'r,
His pen in haſte the hireling taſk to cloſe,
Transform'd the ſtudied ſtrain to careleſs proſe.

" and the object. The rules of Perſpective, as well as all other rules, may be " injudiciouſly applied; and it muſt be acknowledged that a miſapplication of them " is but too frequently found *even in the works of the moſt conſiderable artiſts*. It is " not uncommon to ſee a figure on the foreground repreſented nearly twice the " ſize of another which is ſuppoſed to be removed but a few feet behind it; " this, though true according to rule, will appear monſtrous. This error proceeds " from placing the point of diſtance (vaniſhing point) too near the point of ſight, " by which means the diminution of objects is ſo ſudden, as to appear unnatural, " unleſs you ſtand ſo near the picture as the point of diſtance requires, which " would be too near for the eye to comprehend the whole picture; whereas, " if the point of diſtance is removed ſo far as the ſpectator may be ſuppoſed to " ſtand in order to ſee commodiouſly, and take within his view the whole, the " figures behind would then ſuffer under no violent diminution. Du Piles, in " his note on this paſſage,[a] endeavours to confirm Freſnoy in his prejudice by " giving an inſtance which proves, as he imagines, the uncertainty of the art. " He ſuppoſes it employed to delineate the Trajan pillar, the figures on which, " being, as he ſays, larger at the top than at the bottom, would counteract " the effects of Perſpective. The folly of this needs no comment; I ſhall only " obſerve, by the bye, that the fact is not true, the figures on that pillar being " all of the ſame dimenſions:"

> " Yet deem not, youths, that Perſpective can give
> " Thoſe charms *complete* by which your works can live."

It would be a vain expectation indeed, and ſuch a one as I am perſuaded was never formed, to imagine that linear perſpective could give *thoſe charms Complete by which alone their works* (Painters) *ſhould live*. If their works poſſeſſed no other charm than linear correctneſs, they would be of little value, and not likely to charm, or live long. To look, that Perſpective ſhould find the true contour of regular objects, and aſſiſt in deſcribing irregular ones, is all that was ever wiſely hoped from it, and all that it can impart.

> " What tho' her rules may to your hand impart
> " A quick *mechanic* ſubſtitute for art."

Theſe verſes are abſolutely devoid of ſenſe; yet it may be perceived what is endeavoured to be intimated. By *art* is meant intuition, or genius; and it wiſhes to ſay that intuitive genius is preferable to mechanic ſkill; and that it is better to poſſeſs a fine imagination, even with error, than a plodding correctneſs without taſte.

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[a] Notes by Du Piles, to Dryden's tranſlation of Freſnoy's Poem.

> "Yet *formal geometric* ſhapes ſhe draws."

What has Perſpective, in a general ſenſe, to do more particularly with *formal geometric ſhapes*, than with any other figures? Are the rules and principles of that art applicable only to the Cube, the Titraedron, the Icoſaedron, &c.? Becauſe, in treating expreſsly on this ſubject, it is beſt explained by applying its inſtructive leſſons to regular objects, as being moſt viſibly ſenſible of its influence, is it to be inferred, that when known to its fulleſt extent it ſtill reſts attached an appendage to architecture only, and has no further application? Who ſo concludes has very confined notions indeed of its pervading power, which equally governs irregular as regular objects, and has as much influence in the drawing of the human form, as in drawing a regular piece of architecture, or, as termed by Freſnoy, *formal geometric ſhapes*.

> "Hence the true *genius* ſcorns her *rigid* laws:
> "By *nature* taught he ſtrikes th' unerring lines,
> "Conſults his *eye*, and as he *ſees* deſigns."

That pleaſing flattering word, Genius! what miſchief has it done! and is here given in a very deluding ſenſe, to the undoing of the Pupil, who is hereby led to conceive what he would otherwiſe probably never have had the boldneſs to imagine. Sir Joſhua Reynolds had, no doubt, obſerved many inſtances of the miſguidance of that fatal word; and, in his ſecond diſcourſe, places it in the very light it ſhould ever be conſidered; as a ſomething to be formed and ſtrengthened by reaſon, but not to ſoar beyond it. He ſays, "There is one precept, however, in which I ſhall only be oppoſed by the "vain, the ignorant, and the idle. I am not afraid that I ſhall repeat it too "often. You muſt have no dependance on your own *genius*. If you have great "talents, induſtry will improve them; if you have but moderate abilities, "induſtry will ſupply their deficiency. Nothing is denied to well-directed "labour: nothing is to be obtained without it. Not to enter into metaphy"ſical diſcuſſions on the nature or eſſence of genius, I will venture to aſſert, "that aſſiduity unabated by difficulty, and a diſpoſition eagerly directed to "the object of its purſuit, will produce effects ſimilar to thoſe which ſome call "the reſult of *natural powers*."

A fine talent by nature will ſtill do little without cultivation; and it is not an eaſy matter to draw as we ſee. To draw as we ſee, with any tolerable correctneſs, is the reſult of knowledge and long attentive practice; and even then do we ſeldom ſtrike the *unerring* line. According to Reid and other minute inveſtigators of the human organs, ſight is the moſt deceptive ſenſe we have, and particularly requires the aid of experience and judgment. I will now cloſe my remarks on this extraordinary paſſage, which merited not ſo much notice but for the general worth of the whole Poem, eſteemed the moſt brief and juſt in its precepts that ever was penned.

A ſmall treatiſe on painting was publiſhed in 1764 by Count Algarotti, wherein, among various ſubjects, ſeparately treated on, as of conſequence to the compleating a painter's education, is a chapter relative to perſpective; and ſo extremely judicious are the obſervations, as to the uſefulneſs and neceſſity of a perfect knowledge of that art, and ſo forcibly is it there pointed out, that no thinking Artiſt can read them without being ſtruck with their truth, and determining, if not already acquainted with ſo uſeful an information, to obtain the knowledge immediately. I cannot better ſecond that Author's arguments, they ſo perfectly agree with my own, than by tranſcribing them. He ſays, "The ſtudy of Perſpective "ſhould go hand in hand with Anatomy, as not leſs fundamental and neceſſary. In "fact, the contour of an object drawn upon paper or canvas, repreſents nothing "more than ſuch an interſection of the viſual rays ſent from the extremities of it "to the eye, as would ariſe on a glaſs put in the place of the paper or canvas. "Now, the ſituation of an object at the other ſide of a glaſs being given, the de-"lineation of it on the glaſs itſelf, depends entirely on the ſituation of the eye on "this ſide of the glaſs, that is to ſay, on the rules of perſpective; a ſcience, which, "contrary to the opinion of moſt people, extends much farther than the painting "of ſcenes, floors, and what generally goes under the name of quadratura. Per-"ſpective, according to that great maſter, Da Vinci, is to be conſidered as the reins "and rudder of painting. It teaches in what proportion the parts fly from, and "leſſen upon, the eye; how figures are to be marſhalled upon a plain ſurface, and "foreſhortened. It contains, in ſhort, the whole rationale of deſign.

"Such are the terms, which the maſters, beſt grounded in their profeſſion, have "employed to define and commend perſpective; ſo far were they from calling it "a fallacious art, and an inſidious guide, as ſome amongſt the moderns have not "bluſhed to do, inſiſting that it is to be followed no longer than it keeps the high "road, or leads by eaſy and pleaſant paths. But theſe writers plainly ſhew, that "they are equally ignorant of the nature of perſpective, which, founded as it is "on geometrical principles, can never lead its votaries aſtray, and of the nature "of their art, which, without the aſſiſtance of perſpective, cannot, in rigour, ex- "pect to make any progreſs, nay, not ſo much as delineate a ſimple contour."

All muſt unite in opinion with this informed writer, and agree that the ſtudy of perſpective ſhould go hand in hand with anatomy as being not leſs a fundamental information; he might have ſaid *more* fundamental, for without the aſſiſtance of perſpective, a knowledge of anatomy would be half uſeleſs; as how could any particular exertion of the muſcular frame be expreſſed without juſt delineation? obtainable only from a thorough knowledge of Perſpective. Leonardo Da Vinci was preciſely of the ſame opinion, and in his treatiſe on painting, among numerous pertinent obſervations on the art, he expreſſly ſays, "Thoſe who venture on "the practice, (of painting) without firſt qualifying themſelves in the theory, "are like mariners putting out to ſea without either helm or compaſs, ignorant "what courſe to take. The practice ought always to be built on a rational theory, "of which perſpective is both the guide and the gate; and, without which, it is "impoſſible to ſucceed, either in deſigning, or in any of the arts dependant thereon."

Leonardo Da Vinci wrote a treatiſe ſolely on perſpective; but this, if ever publiſhed, I have never ſeen, but make no doubt, it was confined in its information and principles, comparatively to what is now known and practiſed. Yet was the knowledge of it then thought materially eſſential; in what light would it have been eſteemed, perfected as it is at preſent? My ſubject needed not that I ſhould have quoted opinions in ſupport of its uſefulneſs, but I have choſen thoſe great authorities to corroborate and give weight to my own obſervations on it; for, as Sir Joſhua Reynolds truly obſerves, "we are never ſatisfied with our own opinions, "whatever we may pretend, till they are ratified and confirmed by the ſuffrages "of the reſt of mankind."

It is common to hear it advanced, as an apology for not knowing perſpective, that the ſtudy of it is dry and unintereſting, and that in many caſes it is not to be depended on. Allowance muſt ever be made for difference of taſte and opinion: but with all due deference, I ſhould deem the ſtudy of anatomy much more dry than that of perſpective; yet with what patient application will a ſtudent in painting, emulous of fame, appropriate two, three, four, years of his time to acquire a competent information in that neceſſary branch of his art. I would aſk for what purpoſe is ſo much time ſpent over ſkeletons and anatomized human bodies? The anſwer would moſt aſſuredly be, to be correct in the outlines; and that from a knowledge of the cauſes of action and its effects, appropriate expreſſion may be given in every poſition, and that, without the aid of a model, and even where a living model would be imperfect, from langour of attitude. If then ſuch labour is neceſſary to arrive at the knowledge of what *ſhould be drawn*, ſhould that art be neglected which teaches *how* to expreſs thoſe forms, and *how* to tranſmit them to the canvas? The acquirement of the former information is uſeleſs without a knowledge of the latter, of which a competent inſight might be acquired in three, or at moſt in ſix, months. That perſpective is not to be depended on, is an unjuſt allegation, it is infallible. From injudicious proceeding its delineations may ſometimes be diſtorted, but that is not to be attributed to the deficiency of the art, but to the want of judgment in laying down the proper preliminaries.

That painter is alſo greatly miſtaken, who imagines that preſpective is not equally applicable in the delineation of the human form, as of right lined figures. From a want of it, ſhameful enormities are committed; foreſhortened limbs made too long, a figure extended on the ground, feet or head foremoſt, in a foreſhortened poſition, not repreſented its juſt length, often twice the length it ſhould be, and ſometimes thrice, of which I could point out but too many inſtances in works, not of inferior artiſts. The portrait painter even, frequently ſhews his deficiency in perſpective, by making, as the profeſſors would ſay, his heads out of drawing; the off-ſide of the face larger than the near; one eye higher than the other; the noſe not in the middle of the face, when not ſo in the original; and like inſtances of want of correctneſs in the ſight: but he muſt not expect to have the compaſſes in the eye, who has not long held them in his hand. It may be allowed, that great incorrectneſs is ſeldom committed, by an attentive, experienced artiſt; it may be admitted, that the eye by much practice, and nice obſervation, may become ſo correct as to render it little liable to great errors; but one twentieth part of the time, by long practice employed to arrive at ſuch critical diſcernment, ſpent in acquiring a competent knowledge of perſpective, would make an artiſt of genius much earlier, and infinitely more, correct and deciſive.

To every painter ſome knowledge of Architecture is abſolutely neceſſary; he cannot produce the auxiliaries of building to his pictures without it; and the higher are his aims the more informed ſhould he be in this great aid to his effects. 'Tis lamentable to obſerve the deficiency manifeſted in this particular, I will uſe the words of Sir Joſhua Reynolds, "in the works of the moſt conſiderable artiſts," being as well applicable to their deficiency ſhewn in knowledge of architecture as perſpective. Their pedeſtals, their capitals, and baſes of pillars, their architraves, impoſts, &c. from their total want of profeſſional accuracy, expoſes them, with concern I have obſerved it, to the ridicule of the builder's apprentice. The architecture of an hiſtorical piece, or ſubject of a whole length portrait, may not be a firſt-rate object, nor a ſecond, nor a third-rate conſideration; it may be thrown to any diſtance of importance, at pleaſure; all I mean to dwell on is, that it *is* thought proper to *be* introduced, then, if introduced at all, though *kept down* [a] to any poſſible degree next to obliteration, it ſhould be properly delineated, by poſſeſſing the character of the kind of architecture intended to be repreſented.

The French painters, in general, ſhew a laudable attention to their aiding concomitants, be they in what department they will; a fine inſtance, among many, is ſhewn in that truly great performance, the portrait of Lewis XVI. by Callet, where the ſtyle and correctneſs of the architecture, and the truth of the perſpective, are a reproach to moſt Britiſh productions of the ſame nature; which, to be rid of that great trouble, are conſtantly backed by a curtain, or troubled landſcape, or clouded ſky, even when the ſubjects are the portraits of noblemen or ſenators in their robes, or ladies in drawing-room dreſſes.

The ſtudy of perſpective combines that of architecture along with it, becauſe the preciſion of architectural ſubjects moſt obviouſly expreſſes its effects. The acquirement therefore of a knowledge of perſpective has a double advantage, uniting two informations, without the help of which, an artiſt is neceſſarily compelled to wander in uncertainty; and to feel his way, as do the blind, uncertain of their path.

And here I cannot avoid remarking on a new proceeding that has lately been adopted, and is daily gaining ground, as it were to the excluſion of *all neceſſity* of the introduction of architecture, or the effect of perſpective in hiſtorical ſubjects, where it would be a proper and almoſt indiſpenſable requiſite; and this is, the practice of crowding three, five, or ten, or more, Herculean figures into the ſmall compaſs of the frame, ſo crammed upon one another that ſufficient room is not given for action; and the whole appears a ſcene tranſacted in a cloſet, and that of no greater compaſs than from eight to ten feet ſquare; which ſmall extent of platform has been thought, by ſome, ſufficient ſpace for expreſſing the ceremony of a public execution, or grandeur of a coronation.

A technical term of painting, implying dullneſs of tint, ſhunning of inſpection.

In ſcenes of great extent, whether repreſenting tranſactions within or without the walls of a palace, or caſtle, appropriate architecture, well introduced, produces grand effects,[a] as may be ſeen in many of the works of the Roman and Venetian ſchools. Indeed moſt of their great painters were great architects. I could readily draw out a long liſt, but the few following names are of ſufficient authority and celebrity, to inſtance that a combination of the two arts is not at all detrimental to either. Leonardo Da Vinci, Raphael, Julio Romano, Hans Holbien, Vaſari, Paolo Veroneſe, Michæl Angelo, Rubens, Domenichino, Freſnoy.

Many have a notion that perſpective, not only merely relates to architectural ſubjects, but to them ſimply when they are repreſented as receding in the picture, and exhibiting in a ſmall ſpace of a plane placed direct before the eye, the appearance of great depth of ſtructure as retiring farther and farther off, particularly in inſide ſubjects; as looking down the aiſles of churches, long galleries, and the like; in which caſes, the nearer the eye is to being in the plane of the extent looked at, the ſhorter will be the ſpace required in which the depth of the ſubject will be to be delineated, and the greater and more ſudden the apparent convergency of horizontal lines. Such delineations appearing to the not well-informed in the ſubject of delineation, unpleaſing pictures, and not being able to reconcile to their minds, what is, apparently, ſo repugnant to truth, I have heard it obſerved that ſuch ſubjects were too much in perſpective, when it was only meant to imply, that the point of view was taken too cloſely to the plane of the building, to have a ſatisfactory, and pleaſing picture of the object. To ſay any ſubject is drawn too much in perſpective, is tantamount to ſaying, it is too well, or too naturally, repreſented.

Among the various informations and acquirements forming a polite and liberal education, as well of a lady, as of a gentleman, the art of drawing ever did, and

[a] One of the greateſt painters of the preſent day, I know, entertains very juſt, and, I believe, original ideas, as to the applicable introduction of architecture into hiſtorical compoſitions. When the ſubject is of a ſolemn kind, as a funereal or ſacred proceſſion, the architecture, he conſiders, ſhould be of few parts, grave, maſſive, and very little ornamented, with its horizontals in a parallel direction, or nearly ſo, with the picture; in ſubjects of leſs gravity, the architecture may admit of more diviſion, be lighter and more ornamented, and a quicker declination of horizontals may be more congenial; in ſcenes of mirth and feſtivity, the architecture may be ſevered, various, light, and ornamented. To the feeling mind I cannot better inſtance what I underſtand of theſe notions than by drawing a parallel to them from poetry, and Pope's Eſſay on Criticiſm furniſhes me with an admirable one.

When Ajax ſtrives ſome rocks' vaſt weight to throw,
The line too labours, and the words move ſlow:
Not ſo, when ſwift Camilla ſcours the plain,
Flies o're th' unbending corn, and ſkims along the main.

always will, hold a diſtinguiſhed place. The certain and general principles for attaining that elegant accompliſhment, which perſpective affords, are abſolutely neceſſary to be known, to draw even the ſlighteſt ſketch from nature with preciſion; and to judge with truth the works of others. The deſire of attaining to great excellence in any art would be conſiderably checked, if there were not to be found admirers ſufficiently informed in their judgment, as to be well able to diſcriminate difference of excellence. The praiſe of having done well, is a powerful inducement to further improvement.

Drawing, in my opinion, is a vehicle of communication among mankind, as neceſſary to be ſomewhat informed in, as the art of writing. The pen may expreſs our ſentiments, but not always our ideas and conceptions; at times, that can alone be done by the pencil. A mechanic is required to execute a new and ſingular piece of work; it is impoſſible he can thoroughly conceive it without a draft, the which, not being able to give, is a ſpecies of ignorance nearly as great as the not being able to write; and a deficiency that many an intelligent perſon has mortifyingly and detrimentally experienced. The moſt laboured deſcription of ſcenes, conveys not half ſo perfect an idea of their form and effect, as a few juſt lines of the pencil. Drawing is an univerſal language, comprehenſible to a very ſavage, and plainly ſpeaks to every eye. No perſon therefore, deſirous of a liberal education, ſhould be deficient in a tolerable acquaintance with the firſt principles of delineation, perſpective.

Few who take upon them the taſk of teaching drawing, are qualified for the profeſſion they engage in. In Landſcape drawing, the pupil is ſet to copy houſes, trees, &c. after a promiſcuous manner, to reſemble as nearly as they are able thoſe of their originals; but without being made acquainted with any fixed principles of delineation in general. They advance from ſimple to complex ſubjects, and, when capable of making a tolerably decent copy in colors, are looked upon to be greatly ſkilful; though at the ſame time they are as incapable of doing any thing original, or of taking a view from nature, as if they never had handled a pencil. They are made to draw ſlant lines to repreſent horizontal ones; to make parallel lines tend to a point of union; ovals to repreſent circles; acute, or obtuſe angles to repreſent right ones; but without being ſhewn the reaſon, or having the cauſe demonſtrated to them, why they do ſo.

It is common for perſons after long inſtruction in drawing, under what are termed able maſters, and after they have obtained great proficiency in copying, to requeſt being informed how they are to take a view; to do which they feel themſelves as incapable, as would be their pencil without the guide of the hand and judgment. This would not be the caſe had their maſters, from time to time, inculcated the principles of perſpective, by giving familiar objects, as chairs, tables, or other furniture, or ſmall models which they might furniſh, to be drawn as they would appear in different places and poſitions; and after deſcanting on, and correcting the ſketches of them, proceed with their pupils to delineate the ſame exactly by rule, from determined ſtations. The ſolid knowledge that would be thus inſtilled and ingrafted on the more pleaſurable part of the art, would ſo deeply fix the whole, as would render it permanent and readily uſeful, whether in copying, compoſing, or drawing from actual nature.

The whole of my Theory, if it can be called one, is contained in the introduction. I have there briefly explained the nature of, and how to produce perſpective delineations of given, or known objects, from determined ſtations. After the Introduction I proceed to the practice, where, by the cleareſt, and ſimpleſt method that I could deviſe, I have traced the ſubject, in regular progreſſion to the end of my propoſed deſign. To the reflecting mind 'tis needleſs to obſerve that the number of examples given might exceed all bounds, were endeavour made at introducing every poſſible caſe that might be ſuggeſted. In purſuance of my plan the moſt prominent features only have been the object of my attention; ſubordinate ones, and repetition, muſt be left to the care and practice of the ſtudent.

That I might make this work as uſeful and as compact as I well could, and that it might contain in itſelf every information neceſſary to the proſecution of the ſubject, I have prefaced the practice of Perſpective with ſome problems and obſervations on practical Geometry; giving ſuch only as are indiſpenſibly neceſſary to enable the ſtudent to draw correctly the ſchemes required in the practice of perſpective delineations. This I have done, as I conſider it extremely diſcouraging, and deſtructive of the end required, to tell the reader, who opens a book for ſome pleaſing and neceſſary information, that he has firſt ſomething elſe to learn, as a prior knowledge, and which is not there to be obtained, before he can comprehend what he is in ſearch of, and deſirous to know. And this is ſtill more repulſive, when probably the ſufficiency of ſuch prior knowledge is ſo trivial, that it could all be expreſſed in a few pages; to avoid the little addition of which, the ſtudent is turned back, and left to ſearch for the mentioned books without guide or direction of how much, or how little of it, it is neceſſary he ſhould make himſelf acquainted with; a circumſtance ſo diſcouraging as frequently to end in a total neglect of both.

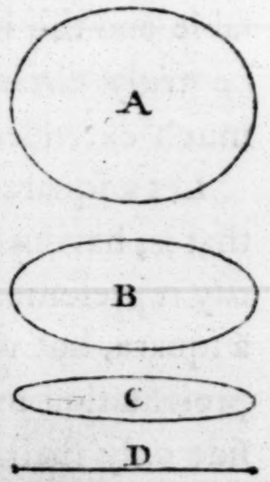
Without a good ſhare of ingenuity and reſolution, 'tis impoſſible to become thoroughly acquainted with any art or ſcience by ſelf ſtudy, from book alone. In the firſt place, what is there ſaid, if not clearly intelligible at firſt, expreſſes but the ſame on a ſecond reading, nor is it placed in any new light on a third; and the ſtudent is left to ponder and work his way, as his genius and his patience ſuits: but let it be obſerved, no information obtains ſo deep a root as that we give ourſelves.

With information and inclination competent to advance, all difficulties will ſpeedily vaniſh, all clouds of darkneſs will diſperſe, and a bright and clear proſpect open to the view; there may indeed a few ſwamps and brambles obſtruct the path and impede progreſs; but theſe I ſhall not only endeavour to remove, but will place ſuch ſtep-ſtones and finger-poſts in the way as will enſure a certain road, and leave little chance of being bewildered, or loſt in a mire. Should my traveller be led unexpectedly into a path apart from the main road, he may reſt aſſured it will be to notice a proſpect by the way that otherwiſe might have eſcaped his obſervation, and that he will be brought a gainer thereby, to the place whence he ſtarted; his mind expanded and eager for further diſcovery. Through the whole I will be the companion of his travels, nor will I enforce my principles by harſh or ſevere means, but uſe him as a friend that I would wiſh to inform. To drop the metaphor, I will do my endeavour to advance ſtep by ſtep unto the end of my purſuit, with a careful attention to the capacity of my ſtudent; advance not any thing I cannot prove, nor leave aught, if poſſible, not clearly explained and inveſtigated. All controverted points I ſhall keep to be diſcuſſed at the laſt, they having nothing to do with true and juſt repreſentation, may be looked into, or not, at the option of the reader; though it does not behove me to paſs them unnoticed.

How far I have ſucceeded in my endeavours at ſimplifying and generalizing my ſubject, the public, who are now become my judges, muſt determine. How far I have juſtly expreſſed my conceptions, or how ſatisfactorily conveyed to others a ſource of great pleaſure to myſelf, I cannot ſay; but of this I am aſſured, that the ſtudy and practice of perſpective may be made as entertaining as any branch of painting whatever, except coloring, and giving relief of light and ſhade, which is the laſt thing a painter has to ſtudy, and which he can never be ſaid to have acquired.

INTRODUCTION.

EVERY thing we ſee is ſeen perſpectively; whether it be a houſe, a man, or beaſt, or tree, or ſhip, or plains, or hills, or water, or all together. It will appear a ſtrange contradiction to advance, but which in a few words I hope to make clear and manifeſt, that no object whatever *appears* as it *is*, in any one point of view; that is, preſents a figure to the eye ſuch as we know it to poſſeſs, but one object alone excepted; which object is a globe. A globe in every point of view, and to every eye at the ſame time looking at it, and in every direction, appears a globe, or ſpherical body bounded by a circular line. Every other object aſſumes, apparently, a different form in every change of poſition, or different point of view whence it is ſeen. A circle, for inſtance, the moſt perfect of plane figures, never appears a circle but in one point of view, and that is, when the eye is perpendicularly over the center of it: in every other ſituation its appearance is an oval, more or leſs extended, the more or leſs the eye is in the direction of its plane; like figures A, B, and C: when the eye is in the direction of the plane of the circle, then is its appearance a right line, as the line D.



Parallel right lines never appear parallel; conſequently a ſquare can never appear a ſquare.

There is no one capable of making ſerious reflection, and of drawing conſequences from certain principles, but muſt be ſenſible and admit, that of two equal heights, one placed nearer the obſerver than the other, that that which is farther off will appear leſs than the one that is nearer. Apparent diminution of ſize, is the reaſon for concluding diſtance of objects: we do not ſcruple to ſay of two men, or of two ſhips, of known equal dimenſions, that one is farther off than the other, becauſe one appears leſs than the other; and that one is much farther off, becauſe it appears much leſs.

This principle being admitted, the conſequences take place in every degree of diſtance, however great, or however ſmall. If the eye of a ſpectator be at E, (Fig. 1, Plate 1,) looking at a height, as AB, and an equal height be at CD, farther from the eye than AB, then will the nearer height AB, appear to the eye ſomewhat higher than the equal, but more diſtant, height CD. For which reaſon, parallel right lines, as was before advanced, can never appear parallel, not even when they are direct before the eye, as the lines AB, and CD. Fig. 2. For if the eye be oppoſite the middle between the extremes of the lines, ſuppoſe oppoſite the point E, then would the diſtance of the two lines at E, as FG, appear greater than the ſame height AC, or BD, at the two extremes; becauſe they are equal heights ſeen at greater diſtances. Conſequently the parallel ſides of a ſquare can never appear parallel, nor the figure be ſeen as it really is: But more or leſs curved, according as the eye is nearer or more remote from the parallel lines regarded.

Now the buſineſs of drawing, that is, of drawing perſpectively, is to delineate things as they appear, in every poſſible direction that they can be preſented to the eye; and not as they are, or as we know them to be. Thus of a book, ſuppoſed placed in various poſitions on a table, as Figs. 3, 4, 5, and 6, which, though all correct delineations of the ſame object, are nevertheleſs all different in their repreſentations, expreſſing the book as ſeen in as many different poſitions. If a baſon is delineated, as ſtanding on a table, it is moſt commonly repreſented as Fig. 7, which may be truly its appearance from a certain point of view, and ſatiſfactorily indicate the real form, in the ſituation intended, to moſt beholders; yet is neither the baſon, nor the table it is repreſented ſtanding on, ſuch figures as the table and the baſon are really known to be; for the tops of both are known to be truly circles; yet in their *repreſentations* they are made ovals, and ovals very much extended.

Let a ſquare box, which, for particular reaſons, we will ſuppoſe of cubical form, that is, having every ſide a ſquare, be required to be delineated. It is often ſatisfactorily repreſented, as Fig. 8, with one ſide a ſquare, and the top not in the leaſt like a ſquare, but which has the appearance of a ſquare horizontally ſituated. Or a repreſentation may be given, as Fig. 9, with two ſides and a top ſeen, of which one ſide only ſhall actually be a ſquare, the other ſide, and top, very different figures, yet appearing the repreſentations of ſquares ſo placed. Or a cubical form may be repreſented, as Fig. 10, when neither ſide nor top ſhall be actual ſquares, yet all do appear as ſuch, and the whole together conveys a juſt idea of the object intended to

PLATE 1

Fig. 1.

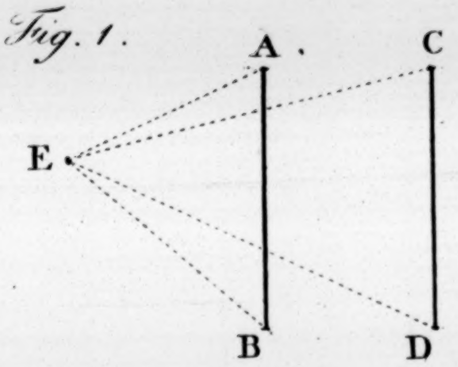


Fig. 2.

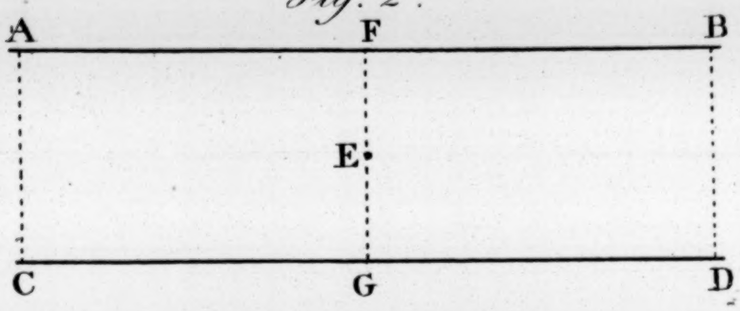
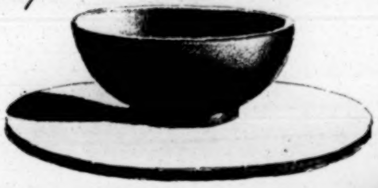


Fig. 7.



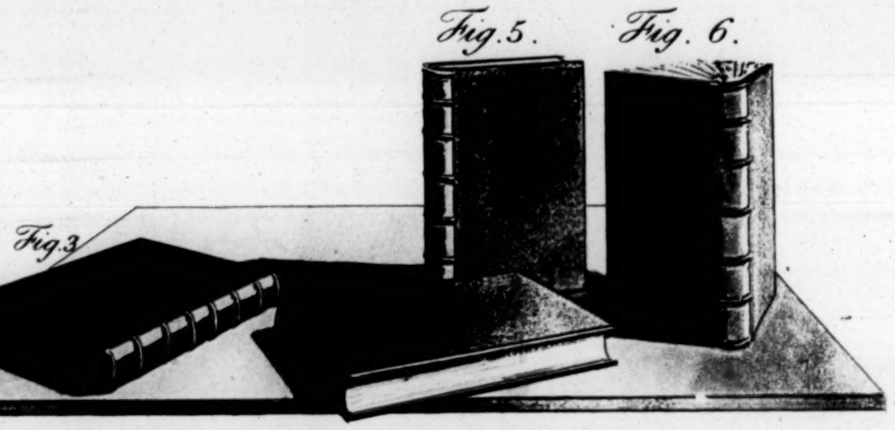


Fig. 5.
Fig. 6.
Fig. 3

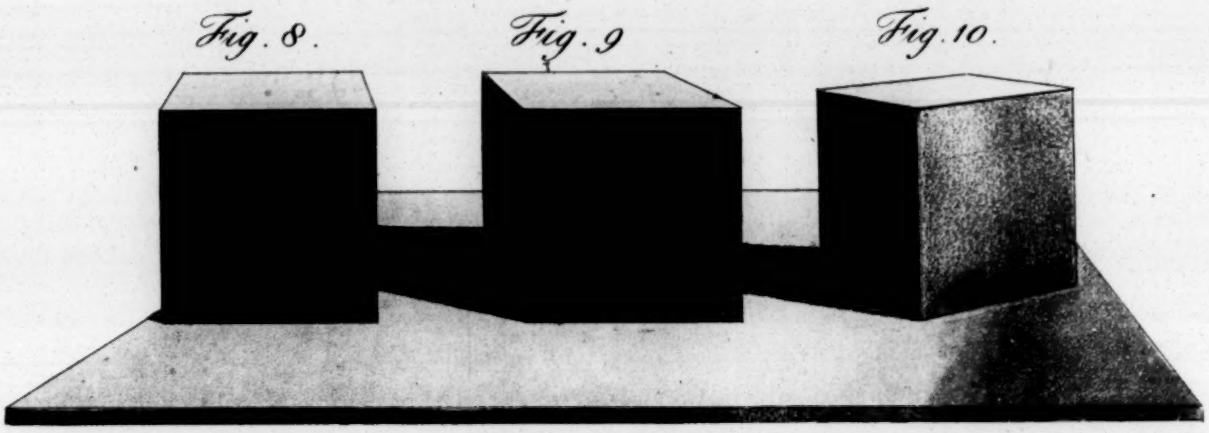


Fig. 8.
Fig. 9
Fig. 10.

Fig. 11.

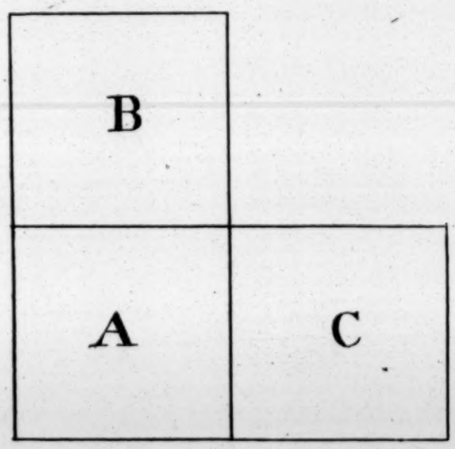
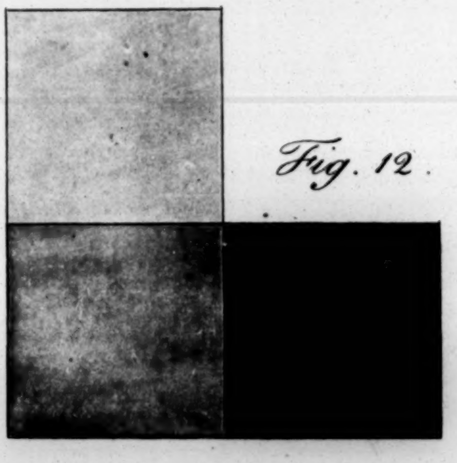


Fig. 12.



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be repreſented: and notwithſtanding the three delineations differ ſo eſſentially from each other, yet do they all, and each, convey the idea of the ſame form, but differently poſited.

Now this effect could not be obtained, by making the repreſentation of each ſide of the object ſeen, a ſquare, the better to indicate a ſquare; for ſuppoſe one only ſo repreſented, as A, Fig. 11, (and one only, of the ſame object, can be truly ſo) the top, B, will not appear a ſquare as placed horizontally, and at a diſtance from you, by being made a ſquare; neither will the ſecond ſide, C, appear a ſquare, as placed at right angles with the other, by being made a ſquare; but altogether will have the appearance of three ſuperficies, all in a vertical plane, and have no ſemblance of a ſolid body; not even when aſſiſted with the effect of light and ſhade; as Fig. 12. for the linear delineation not affecting the eye as the contour of a ſolid body, the three ſquares will appear but as one ſuperficies, variouſly ſhaded.

What has been ſaid of the above particular figures, may be applied to *any* and to *every* figure: a man, a tree, a ſhip, or any form that exiſts. Thus when a man is repreſented with one leg longer than the other, or one arm longer than the other, it is not to be inferred from thence that one leg, or one arm, becauſe not drawn at full length, is meant to repreſent an arm, or leg, ſhorter than the other; but that the leg or arm ſo repreſented, is ſeen, as painters expreſs themſelves, foreſhortened, or contracted in its manner of preſentation to the eye; and ſo of every different poſition. A tree, in one point of view, ſhall appear of very different figure to the ſame tree in another point of view; ſo of a ſhip; and ſo of every object of art or nature.

It is really ſtrange, though not unaccountable, that though we *never* ſee objects as they *are*, but always as they *appear*, that is, perſpectively; yet in drawings of houſes, what are termed geometrical drawings, appear, to the many, to be the moſt ſatisfactory repreſentations of them.

For the ſatisfaction of the uninformed in this particular, I will briefly explain the difference that ſubſiſts between theſe two modes of repreſentation, geometrical and perſpective; that the terms geometrical and perſpective drawing, may be immediately and clearly underſtood in future on the mention; and after a few obſervations thereon, proceed with my ſubject.

By a geometrical repreſentation, as of a houſe for inſtance, is underſtood, that the whole, and every part of it, is drawn according to the ſtrict rules of geometry: that is, that every circle be drawn a true circle; every ſemi-circle a true ſemicircle; every ſquare be made a true ſquare, with its oppoſite ſides parallel, and its angles right ones; and that all parallel lines, in every direction, be really made parallel. Under all which agreements, Fig. 1, Plate 2, is a geometrical elevation of a houſe, wherein may be obſerved that the circles are true circles; the ſquares are true ſquares; that all its windows, intended to be equal, are made equal and alike; and that all horizontal and vertical lines are ſtrictly parallel to each other. Fig. 2, is the geometrical elevation of the end of the ſame building. Such delineations are what are termed geometrical drawings, and are ſuch as are implied when reference is made, in this work, to drawings of objects *as they are*.

A perſpective drawing of a houſe, is the repreſentation of a houſe as it appears, when viewed from any particular ſtation. Fig. 3, is a perſpective repreſentation of the before-explained geometrical drawings, in which it may be obſerved that there is no one figure delineated like unto the originals of which they are the repreſentations. Circles and ſemi-circles are repreſented by ovals and half ovals; ſquares are deſcribed of the figures of lozenges, or more properly of trapeziums; none of their angles are right ones, ſome being very obtuſe, and others very acute; none of its parallel lines, except the vertical ones, are parallel; neither are any two of its correſponding windows of a ſize, though intended to repreſent equal and alike windows. And though this be the univerſal language of nature, and the only preſentations ever offered to our eyes, yet are they not ſo well comprehended in general as are geometrical delineations; which, though it may appear paradoxical to aſſert, are abſurd delineations, and no repreſentation of any real object at all.

I would not have it ſuppoſed that I mean to imply, there is no utility in geometrical drawings; my meaning here is, only relative to their not being repreſentations of exiſting forms as they appear.

Now though geometrical appearances, in real objects, *never* can be ſeen, and perſpective ones always *are* ſeen, yet do the firſt, in repreſentation, ſeem more ſatisfactory to the untutored eye than the other; which, overlooking the appearance of objects, immediately reverts to the thing ſignified; and knowing that houſes in reality are equally high at their extremes, and that their tops are level, and parallel to their bottoms, immediately conclude the former to be true repreſentations, and the latter erroneous conceptions, which, though frequently committed, cannot be defended or accounted for.

If it be poſitively true that theſe irregular figures take place as the repreſentations of others of truly regular forms, is it to be concluded there is ſome determinate preciſe form of repreſentation, from certain conſequences? or is it all random work, and left to the guidance of the eye and reaſon only? The whole is governed by rule, and there is a determinate mode of procedure, upon infallible prin-

PLATE 2

Fig. 1.

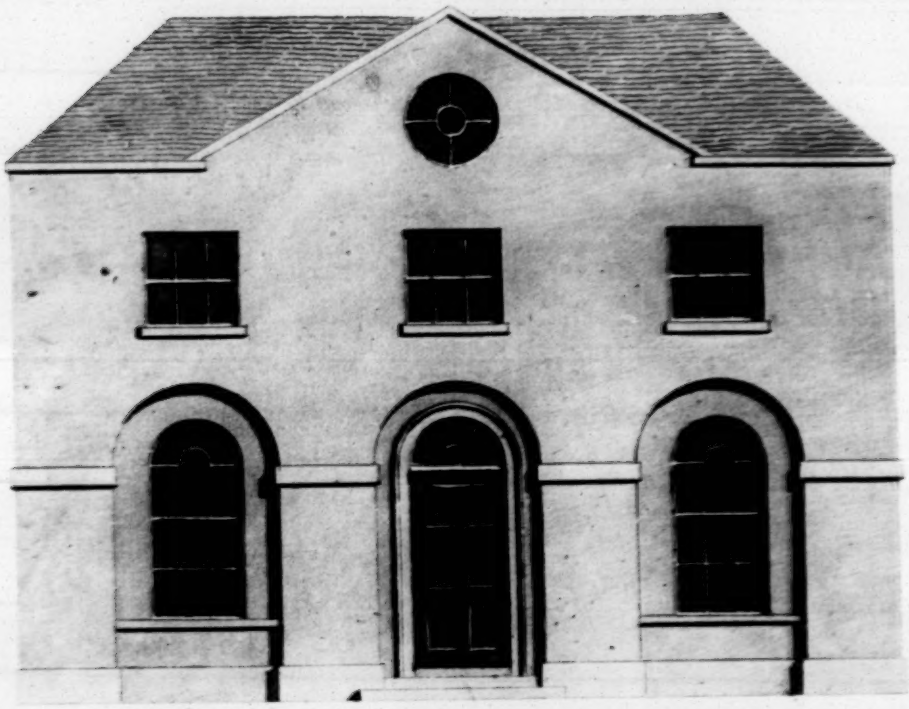


Fig. 2.

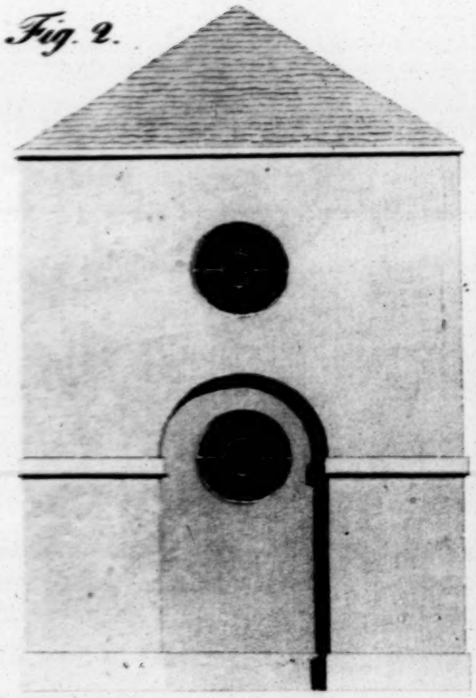
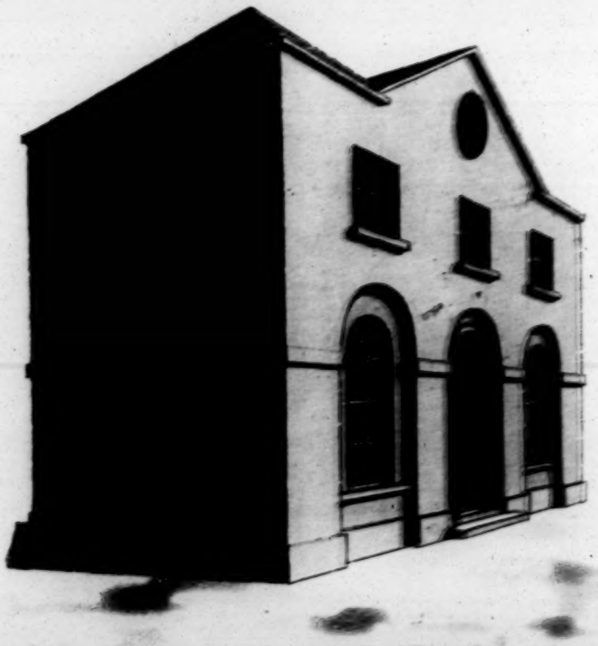


Fig. 3.



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ciples ; by which, knowing the plan and form of the object, and diſtance and height of the eye that views it, a perfect delineation ſhall be effected ; which may ſo impoſe upon the eye, as to be miſtaken for the object itſelf. I will now enter on this important ſubject, but previouſly it will be neceſſary to explain ſome introductory matter, upon which the certainty of effecting this deſirable end is grounded.

The truth of perſpective repreſentations depends upon an eſtabliſhed and certain principle in optics, *that viſion, through the ſame medium, is conveyed in right lines to the eye.* If the attention of the eye be directed to any particular ſpot, it obtains its perception, by a ray of viſion, or of light, extending in a right line between the object and the eye: thus, the eye at E, fig. 1, upon looking at the point A, forms, what is termed in optics, a ray of viſion, or viſual ray, EA, extending in a right line between the point of obſervance and the eye; which line of viſion it is contended, is a right line ; and ſhould any other object, as B, intervene between the firſt point, A, and the eye, ſo as to touch the viſual ray, it would effectually hide the point A from view of the eye at E. To prove that a ray of viſion directed from the eye to any particular point, is a right line, and not a curved one, as ECA, the following ſimple experiment may eaſily be tried, which, anſwering, will incontеſtibly eſtabliſh the fact. Place any height, as AB, (Fig. 2.) before the eye, at E ; half way between the ſight and the firſt height AB, place a ſecond height, as CD, ſo placed, that the other may be ſeen immediately behind it. Then directing the eye to the bottom of the object, mark the place where it will appear (which it will do) to touch the firſt height, as at *b* ; then direct the eye to the top of the far object, and mark where it will appear to touch the firſt height, as at *a* ; then if the ſpace comprehended between *a* and *b*, be but half the height of AB, it will be clear that the viſual rays EA and EB, directed from the eye at E, to the points A and B, are right lines.

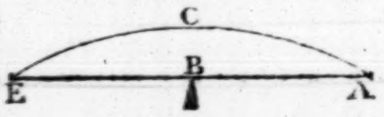
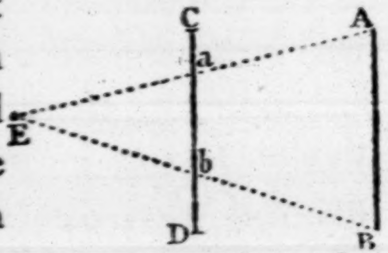


Fig. 2.

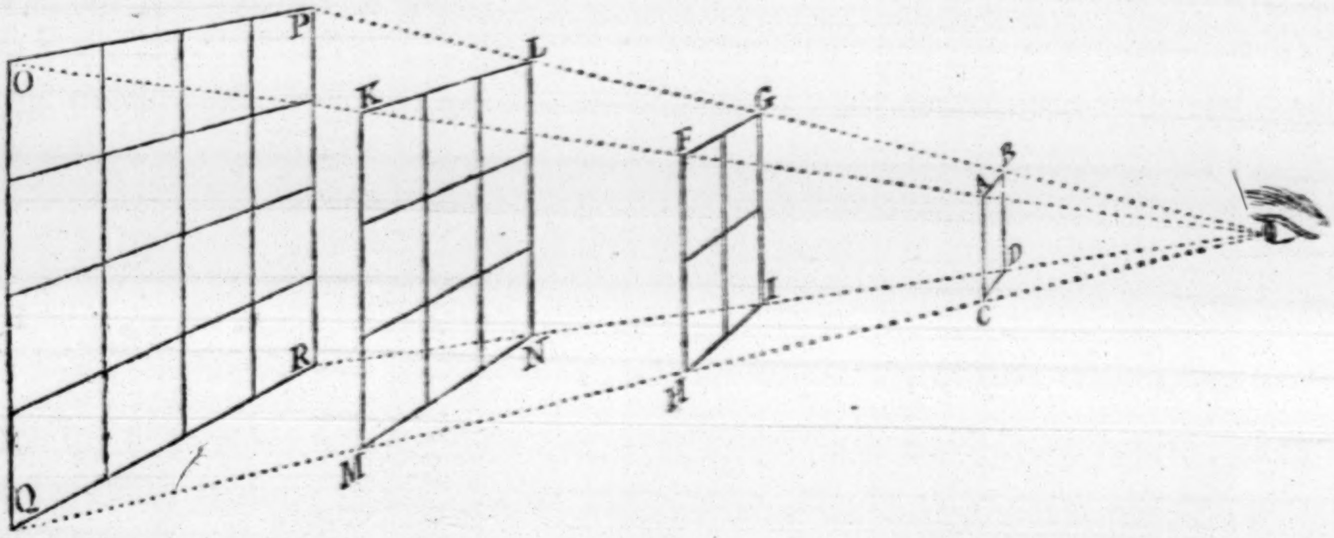


To my reader converſant in geometry, further proof need not be given of the certainty of the viſual rays EA and EB being right lines, than has juſt now been ſtated. The line *a b* is half the line AB, but the line AB is parallel to *a b*, and twice as far from the point E ; then will the lines E *a* A, and E *b* B, be right lines, and the triangles E *a b*, and EAB, be ſimilar.

It would be entirely foreign to the purpoſes of perſpective, to enter more on the ſubject of optics; the eſtabliſhment of this ſingle fact, paves the way to the certainty of all delineation on planes. To prove that rays of viſion are ſubject to refraction, as they paſs through mediums of different denſities, would be entirely irrelevant to the preſent purſuit, which has only one medium of optical pervicity under conſideration, Air; and to that alone we are to be confined. Neither would it be of any account to the preſent inquiry, to inveſtigate the nature or eſſence of light; for whether it is material, or immaterial, is perfectly unimportant here. On ſuch points of contention it is neither my province, nor my inclination, to dwell: it only regards the ſubject in queſtion to eſtabliſh, not by what *means* viſion is performed, but, that it *is conveyed in right lines from the eye*, the eye and the object being in the ſame medium of light; of which I hope demonſtrative, but of which I am certain, (the enquiry anſwering the propoſition) practical, proof has been given.

On the certainty of the direct procedure of the viſual rays from the eye, it is, that we are capable of calculating the exact apparent dimenſions of objects, as they are more and more remote from us. Not that this calculation is of any particular ſervice in perſpective delineations, but only as it obtains inconteſtible proof of what otherwiſe might remain doubtful, the exact proportion of diminution that does take place; and which is, *in the inverſe ratio of the ſquares of their diſtances from the eye that regards them.* If an object be at a certain diſtance from the eye, it will appear four times the dimenſions of an equal object ſeen at twice that diſtance; nine times the dimenſions of an equal body placed at three times the diſtance; ſixteen times as large as an equal body at four times the diſtance; and ſo on, inverſely as the ſquares of the diſtances; that is, inaſmuch as the ſquares of the diſtances increaſe, in the ſame ratio do their apparent magnitudes diminiſh.

If a ſquare, as ABCD, be placed before the eye, it will cover, and hide from view a ſquare of four times its dimenſions, at twice the diſtance, as **FGHI**: conſequently, an equal ſquare, at twice the diſtance, will appear but a fourth part the dimenſions of the firſt, as any one of the four ſquares marked on FGHI. The diſtance is 2, the ſquare of which is 4, the inverſe then is only a quarter, or a fourth part. At three times the diſtance of the firſt ſquare from the eye, it will cover a ſquare of nine times the dimenſions, as KLMN; of conſequence an equal ſquare there, would appear but a ninth part the ſize; the ſquare of 3 being 9, the inverſe of which would be but a ninth part. At four times the diſtance, it would hide a ſquare of ſixteen times its dimenſions, as the ſquare OPQR, determining an equal ſquare there placed, to appear but a ſixteenth part its ſize; the ſquare of 4 being 16, the inverſe is but a ſixteenth part. So the proportion, or ratio, would go on to infinity, agreeably to the inverſe of the ſquares of the diſtances; if at five times the diſtance, but a twenty-fifth part; and, if at ten times, but a hundredth part.



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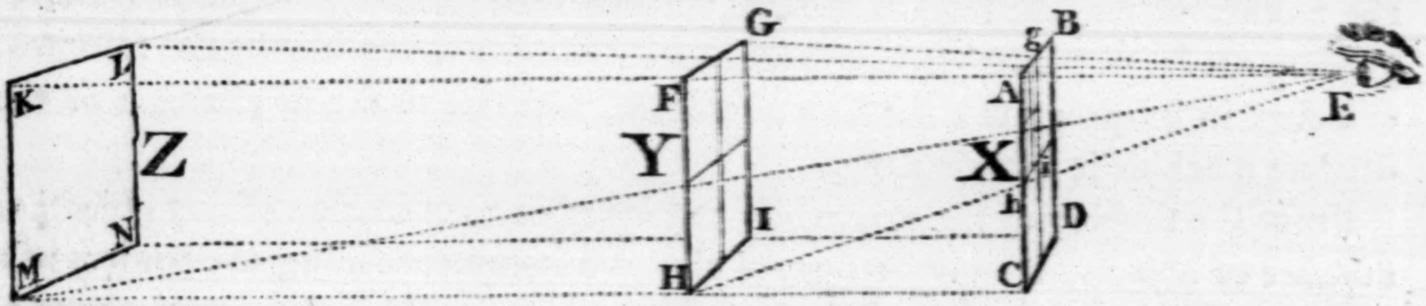
Probably the inveſtigation of this curious circumſtance may be aided by an examination of the following diagram: where



are three equal ſquares, X, Y, and Z, placed direct before the eye at E, each having one corner touching the ſame viſual ray to the eye, K F A E; of conſequence, being all vertical, and parallel to each other, their tops and near perpendicular ſides, are all in the ſame planes of viſion. The ſquare Y being twice the diſtance from the eye at E, that the ſquare X is, appears, to that eye, but a fourth part the dimenſions of the firſt ſquare; as is manifeſt by the viſual rays FE, GE, and HE, which paſſing the plane X, touch it in the points A, g, and h, determining the ſquare A g h i, as its apparent magnitude, when compared with the ſquare X; which ſquare A g h i, is but a fourth part the ſquare X; for the line A h, is but half the line A C, and A g, but half A B; of conſequence then the ſquare A g h i, is but quarter of the ſquare A B C D, or ſuperficies X. In the ſame diagram, the ſquare Z is four times the diſtance from the eye that is the ſquare X; on which account its apparent dimenſions are, when compared to the ſquare X, but a ſixteenth part of the ſquare X, as is clearly evident by the viſual rays K E, L E, and M E, which, interſecting the ſquare X, determines thereon, a ſquare equal a fourth part of the ſquare A g h i, and conſequently but a ſixteenth part of the ſquare X; an apparent diminution agreeably to the proportion intimated, being *inverſely as the ſquares of the diſtances.*

DEFINITION

1. A Visual Ray. Is an imaginary right line extended from the eye, to any particular point, the object of the eye's regard, or contemplation.

It is curious to obſerve the play of the eye, while it is employed in minutely ſurveying any particular object, or objects; to remark its gradual ſhiftings as it changes the immediate ſpot of contemplation to the regarding of another, or others. It will naturally reſult from this conſideration, and the knowledge of viſual rays being right lines, that no two ſpots can be ſo near, but that the direction of the eye will be changed, and a new viſual ray be formed, in the ſeparately examining the one and the other. Obſerve but the dial of a watch; and the motion of the ſhifting of the eye will not only be felt as it paſſes from regarding one hour to another, but it will be ſenſibly felt as it glides by the minutes; evincing in its progreſs a ſubtlety of motion, ſuperior to the mechaniſm of the delicate machine it contemplates.

From the ſhifting of the eye, while employed in examination of any object, or number of objects, it may be figured that while contemplating the borders of a circle (as the minutes of the dial of a watch), there would be generated a cone of viſual rays, of which the eye is the apex, or point, and the dial the baſe; as Fig. 1, Plate 3. And it muſt of courſe be reflected, that, as the objects of contemplation differ in figure, ſo muſt vary the body of the collection of rays proceeding from the eye in their examination. As, ſuppoſe the object a ſquare ſuperficies, ſee Fig. 2. then will there be generated a pyramid of rays; if it be a triangle, then is there another pyramid formed, having a triangular baſe, as Fig. 3; or, the object being a ſolid, as Fig. 4; or the figure may be a man, or beaſt, as Figs. 5. and 6. it matters not what, on the eye's regarding them all around, there will be formed a body of viſual rays, of which the contour of the object regarded, be it what it will, is the baſe, and the eye the apex.

PLATE 3

Fig. 1.

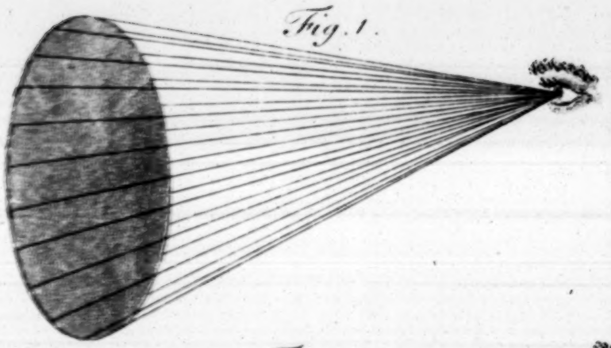


Fig. 2.

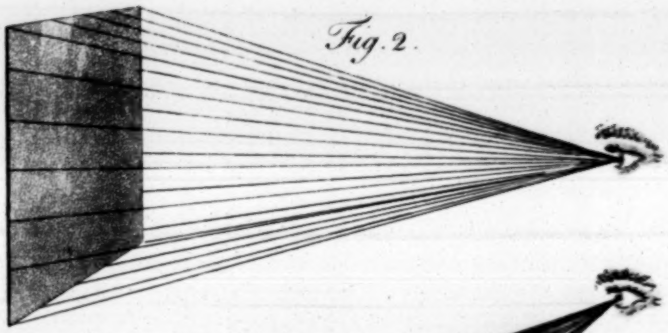


Fig. 3.

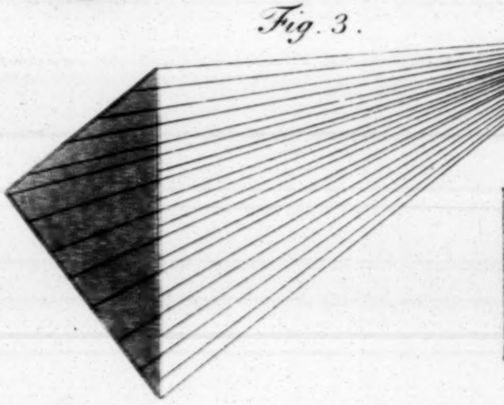


Fig. 4.

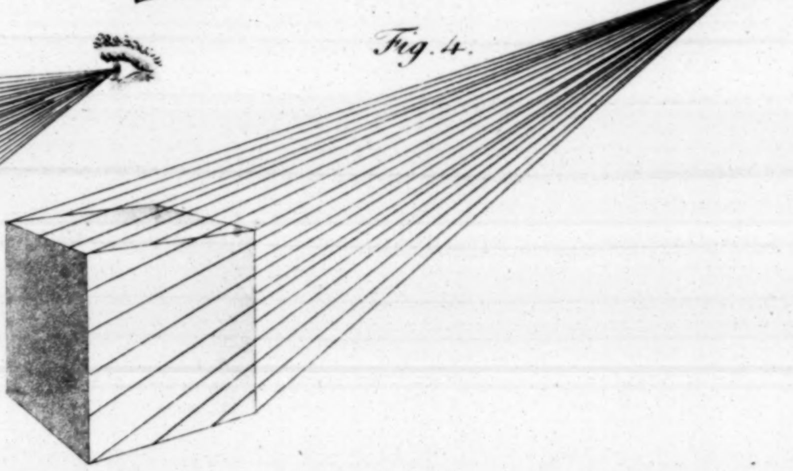


Fig. 5.

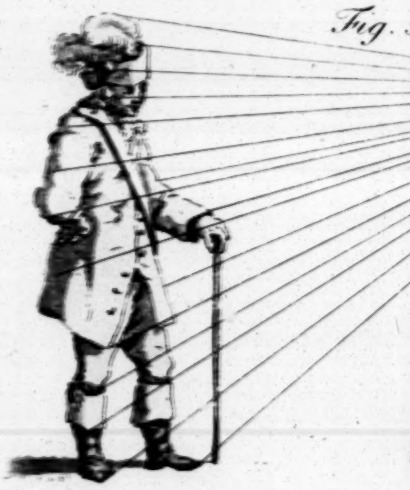


Fig. 6.

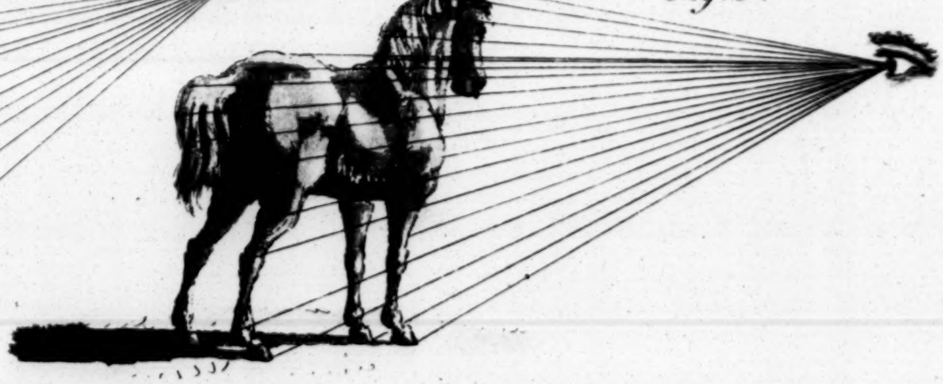


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PLATE. 4

Fig. 1.

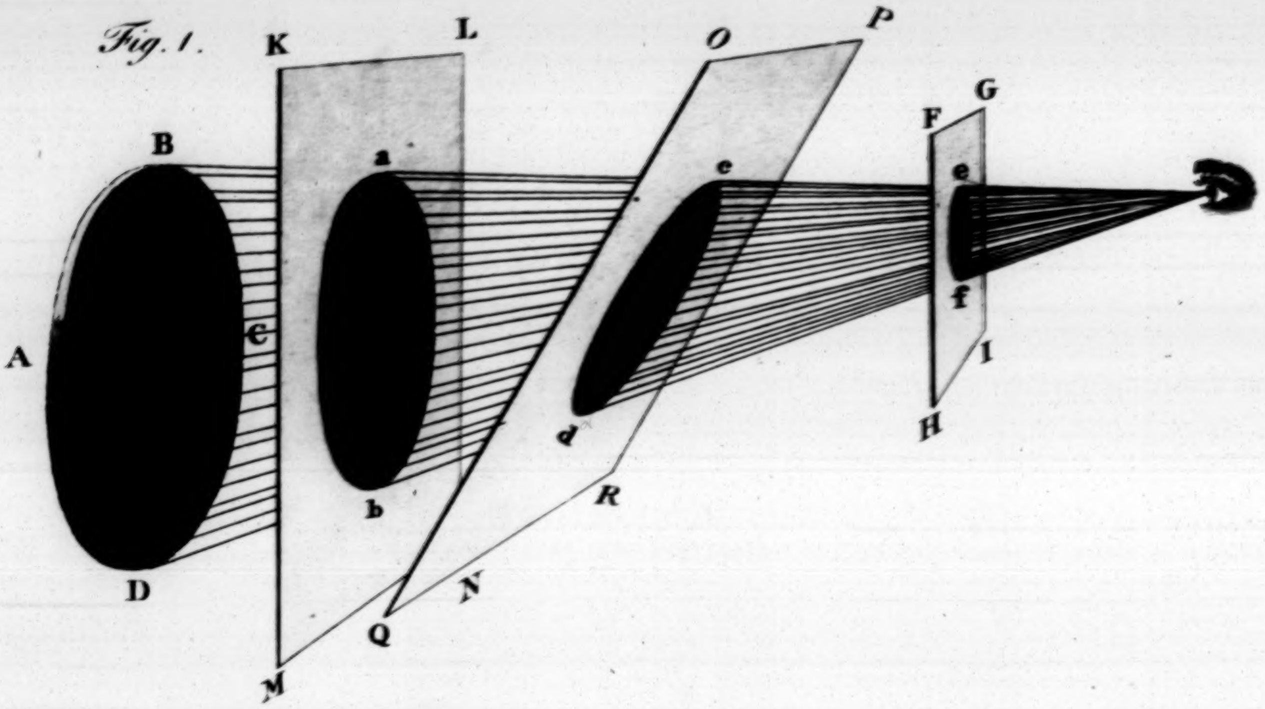
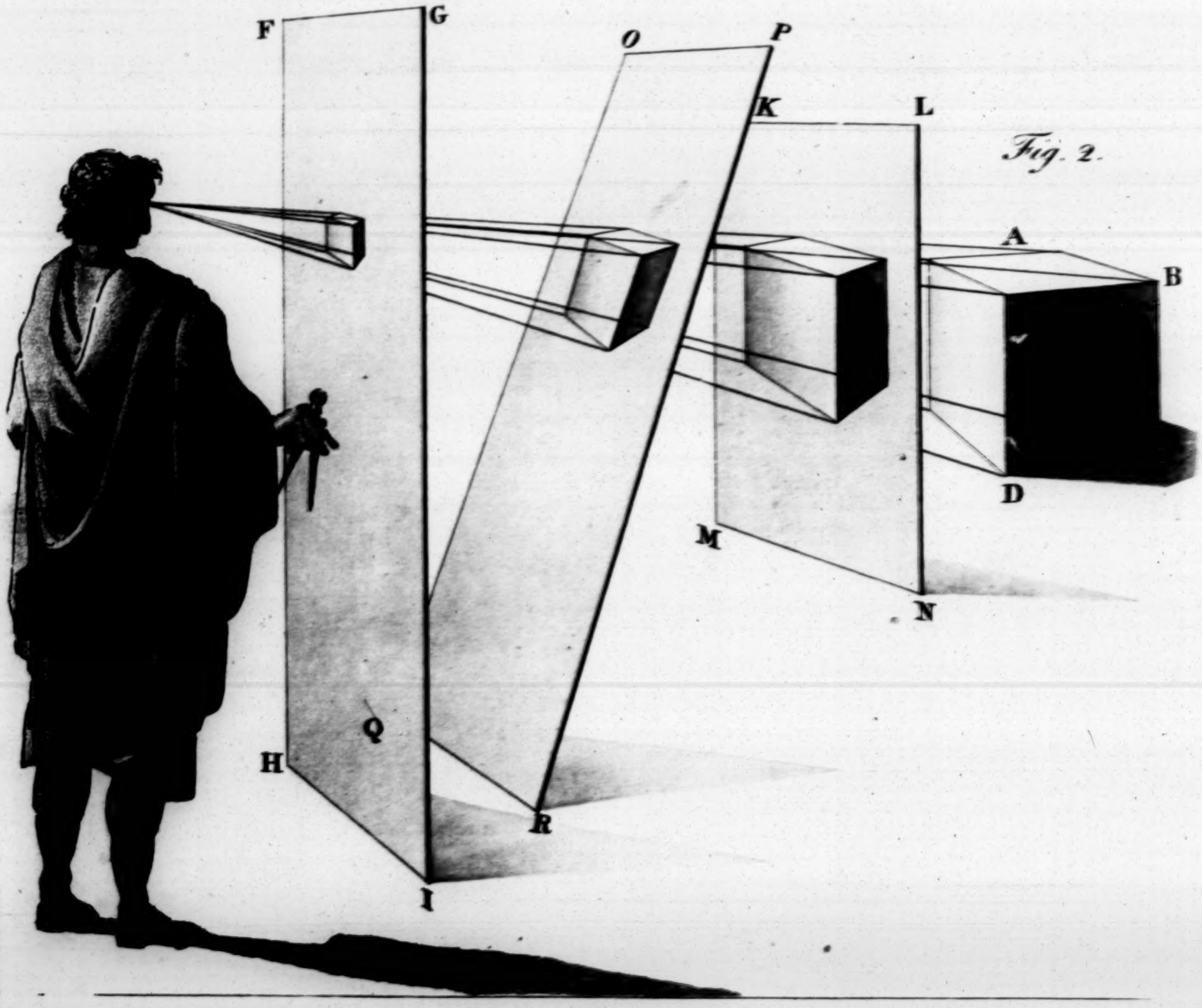


Fig. 2.



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DEFINITION

2. **Visual Rays.** Are any number of imaginary right lines proceeding from the eye, to any object the ſubject of its contemplation.

If the pyramid of viſual rays proceeding from the eye while contemplating an object, be cut by a plane making a ſection of thoſe rays, the figure that would be generated on the plane by ſuch ſection, would be what is termed a perſpective repreſentation of that object; which ſection would be varied in figure and in dimenſions, accordingly as the plane making it, was inclined one way or another, and accordingly as it was taken nearer the eye, or nearer the object. Parallel ſections would be ſimilar figures, and all otherwiſe than parallel, diſſimilar.

Thus of the cone of viſual rays, proceeding from the circle ABCD, Fig. 1. Plate 4; the ſection e f, made by the plane FGHI, being nearer the eye than a b, made by the parallel plane KLMN, the former figure, though ſimilar, is ſmaller; and the ſection c d, made by the inclined plane OPQR, is different in figure from thoſe made by either of the two vertical planes. So of the pyramid of rays proceeding from the cube *ABCD*, Fig. 2; the ſections made by the parallel planes *FGHI* and *KLMN* are ſimilar, but differ in ſize from each other, and in figure from that made by the plane *OPQR* on account of its inclined poſition.

DEFINITION

3. **A Perspective Delineation.** Is a linear repreſentation of any object or objects, as they appear to the eye that regards them: and is ſuch a figure as may be ſuppoſed to be made by a plane making a ſection of the body or pyramid of viſual rays directed from the eye to the objects, while contemplating of them. Which delineation, being ſo tinted as to reſemble the local colours of the real objects, and having the effect of light and ſhade, will convey a lively idea of the real objects, and at the ſame time indicate their poſition and diſtance from the eye of the obſerver.

A Perſpective repreſentation of any object, or multitude of objects, is ſuch a repreſentation as would appear to be made on a plate of glaſs, placed between the eye, and the object or objects of examination. A view ſeen through the window of a room, is, as it appears on that window, a perſpective repreſentation of that view; and if the ſight could be kept confined, and the hand at the ſame time were to trace the figures of the objects on the glaſs, where they appear to touch it, the picture ſo drawn upon the glaſs, would be a perfect perſpective view of the proſpect behind it.

It muſt however be obvious, that every change made in the place of the eye, or the poſition of the tranſparent plane, muſt make a difference in the figure and dimenſions of the ſection of viſual rays; if the plane of glaſs be placed near the eye the ſection will be ſmall; and as the glaſs is removed nearer to the object, the ſection, or repreſentative figure, will proportionably increaſe: alſo, the plane of glaſs may be ſo poſited, as to produce very diſtorted figures indeed, but of that in another place.

Inclined ſections of the pyramids of rays, that is, not vertical ones, are ſometimes taken, as ſubjects of curioſity; but ſeldom as objects of utility. As ſubjects of pictures they are univerſally vertically taken, and, until the concluſion of this work, when ſpecially treating on ſuch ſubjects, they will uniformly be ſo conſidered.

Suppoſe, while the eye is fixed looking through a ſight-hole as at E, (Fig. 1, Plate 5.) at an object, as A B C D F G, a plate of glaſs were placed vertically between the eye and the object; as the plane H I K L. And ſuppoſe the face of the plane of glaſs, towards the eye, to have been finely duſted over with hair-powder; not ſo as to render it impervious to the ſight, but ſo, that the objects might nevertheleſs be diſtinctly ſeen through it. Keeping the eye fixed at the ſight-hole, a ſteady hand could then trace on the glaſs the contour of the object, as it would appear through that glaſs, and would mark the figure *a b c d f g*.

Now it is the buſineſs of the rules of perſpective to find ſuch figure, on an opaque ſurface, as paper, from ſome certain data given or known, as would, when obtained, and properly placed between the object and the eye, affect the eye the ſame as the one traced on the glaſs; for the proof of which, the figure being out, the real object ſhall exactly appear through and fit the aperture; as in Fig. 2, the object does, through the aperture *a b c d f g*, to the eye of the obſerver at E.

Having the two extremes of a right line, the whole line is obtained, by drawing it from one extreme to the other; therefore to find the perſpective of the figure A B C D F G (Fig. 3.) it is only neceſſary to find the points of interſection of the viſual rays E A, E B, E C, E D, &c. from the viſible angles of the object, as they would pierce the plane H I K L, in the correſponding points *a b c d f g*, the lines then being joined together, in their reſpective directions, as is there done, the whole figure is obtained, which is the repreſentation of the contour of the object required to be delineated.

Thus, I hope, I have clearly ſhewn what is *meant* by perſpective repreſentations. I will next proceed to trace a ſimple method by which they may be *obtained*, and at the ſame time will endeavour to explain the infallibility and truth of the proceſs.

Fig: 1.

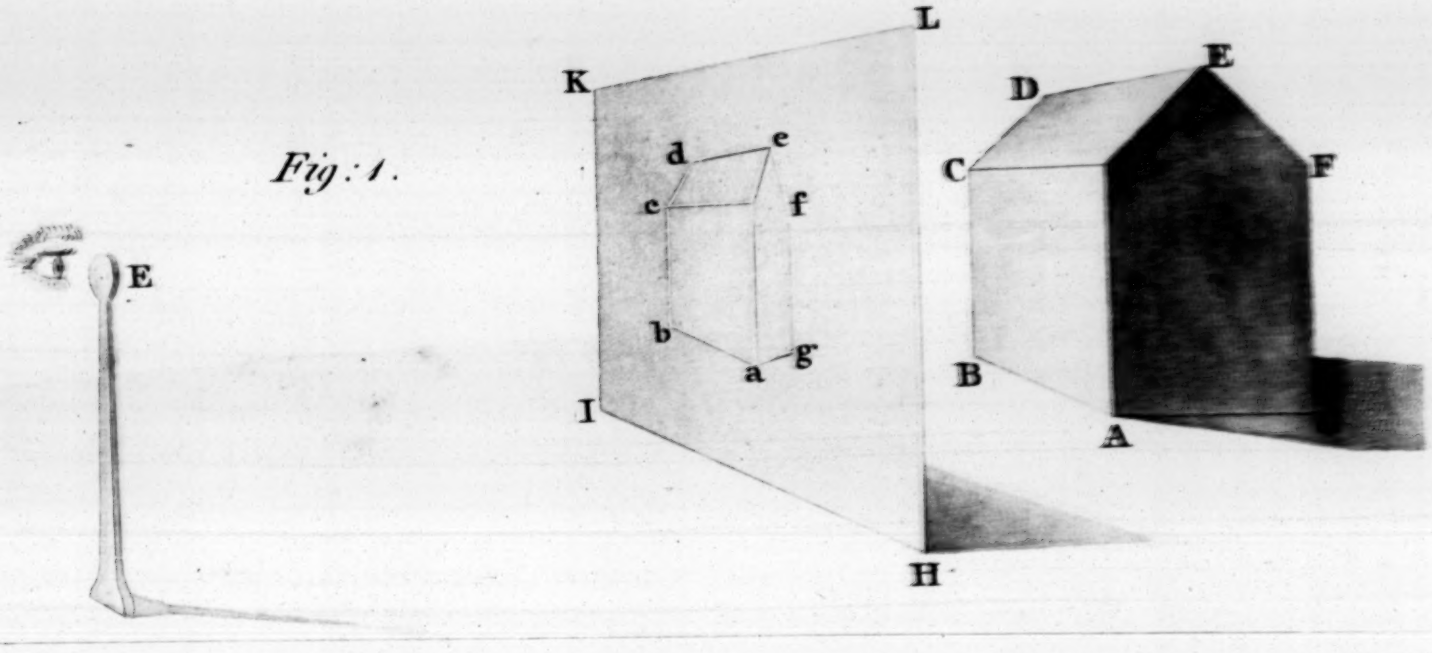


Fig: 2

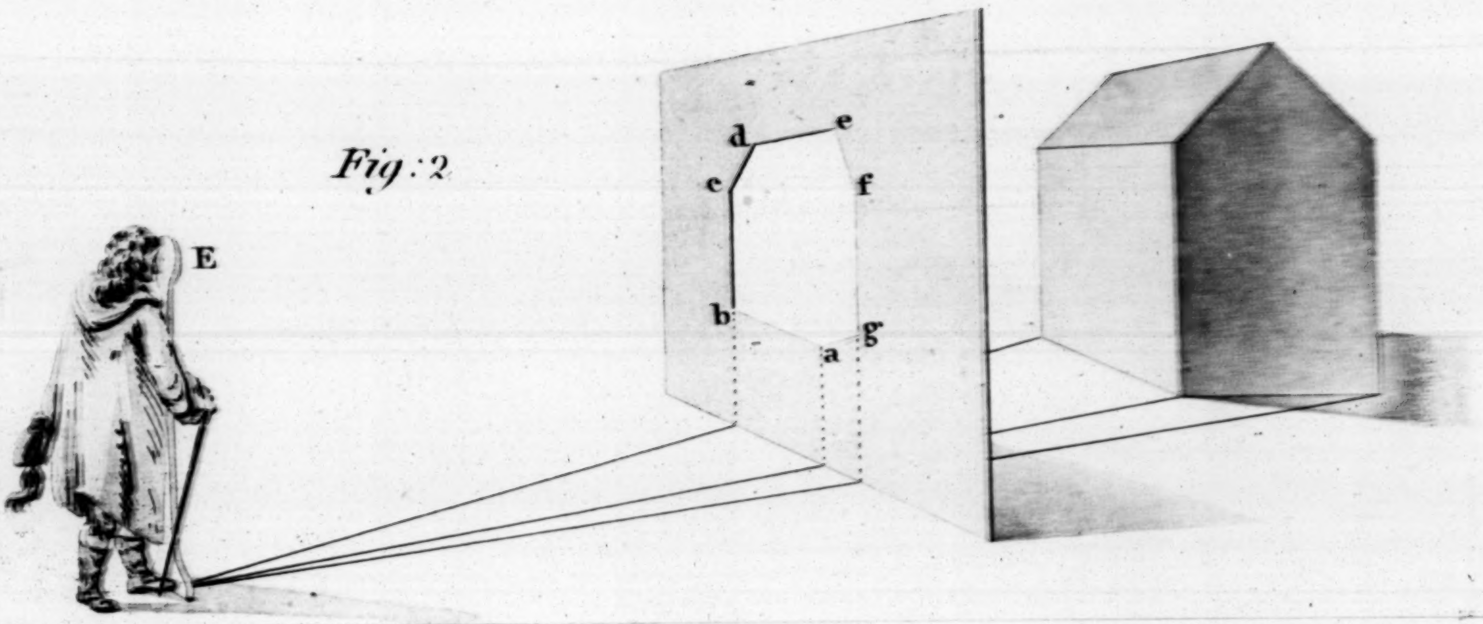
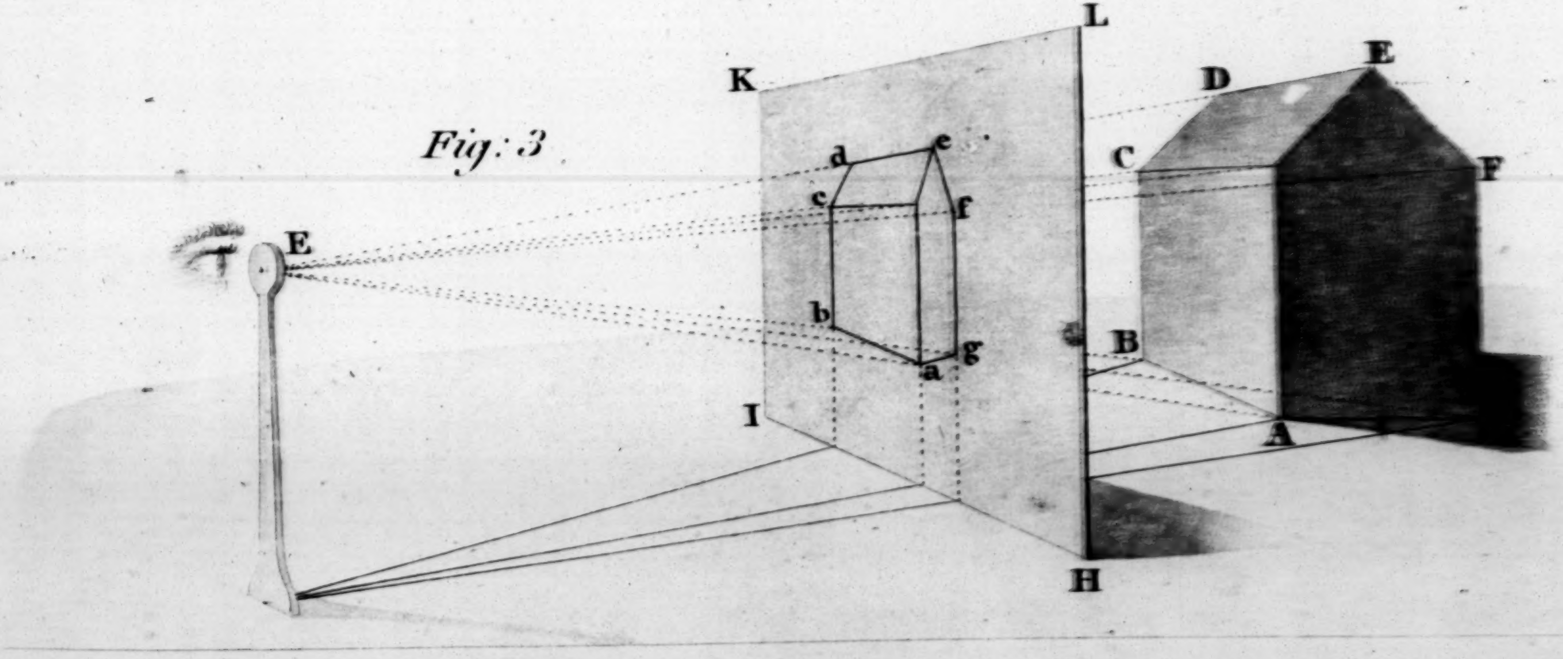


Fig: 3



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As it is certain that the apparent figure of every object is changed by any variation of the place of the eye, ſituation of the object, or poſition of the intervening plane on which the repreſentation is required; it of conſequence follows, that to give a perſpective delineation of any object, the Point of View muſt be fixed, the poſition and place of the Plane of Delineation muſt be determined, and the ſituation and dimenſions of the Original Object, known. With this data premiſed, a perſpective delineation of any object, or multitude of objects, may be obtained, with ſuch certainty and correctneſs, that the figures drawn, being cut out, and the plane on which they are delineated, fixed in its ſtated place, the original object or objects would be found to fit and fill the aperture, without the ſmalleſt poſſible variation.

DEFINITIONS.

4. Point of View, or Point of Sight. Is the fixed place of the eye of the Obſerver, viewing the object or objects to be delineated.

5. Plane of Delineation, or Picture. Is the plane of canvaſs, or paper, upon which the delineation is made, or intended to be drawn.

6. Original Object, or Objects. Is any object or objects, to be drawn; as a houſe, a ſhip, a man, or all, or many of them, together.

7. Original Lines. Are any lines that are the boundaries of *Original Objects*, or of planes in thoſe objects.

8. Horizontal Planes. Are any planes placed truly level; that is, to which the gravity of the plumb-line is truly perpendicular.

The floors, cielings, &c. of every houſe are endeavoured to be made horizontal, and are always ſo conſidered in perſpective delineations of regular Buildings.

9. Horizontal Line. In perſpective, is a line on the *plane of delineation*, level with the eye of the obſerver or *point of view*; and is ſuppoſed obtained by an horizontal plane paſſing through the eye of the obſerver, produced till it cuts the *plane of delineation*.

10. Vertical Planes, Are planes perpendicular to *Horizontal Planes*.

The upright walls of a houſe, its doors, windows, &c. are always conſidered to be truly vertical, being ever endeavoured to be made ſo.

Let it be required to find the perſpective repreſentation of a cube, ſuppoſed placed perpendicularly over the ſquare A B C D, Fig. 1. Plate 6, as it would appear on a plane of glaſs ſtanding vertically on the line G L, to the eye of an obſerver, elevated one inch and a half over the ſtation point, S.

Draw S G parallel to A B, and S L parallel to A D; alſo draw the viſual rays S A, S B, S C and S D; produce the line B A till it touches the line G L in the point I, and draw S O perpendicular to G L. Then, on a plane of paper or canvaſs as GHKL, Fig. 2, draw a line VZ, parallel to GL, and make it one inch and a half above GL; VZ will be the horizontal line. Mark a point at V, and another at Z, as far diſtant from each other, as are the points G and L in the plan, Fig. 1. Take the diſtances G *a*, G *b*, G *c* and G *d*, where the viſual rays interſect the line G L (Fig. 1.) ſeverally in your compaſſes, and mark them off on the line V Z (Fig. 2.) at 1, 2, 3, and 4, and draw fine perpendicular lines through the points. Take the diſtance G I (Fig. 1.), and mark it off at V I (Fig. 2.) and draw a vertical line through the point I; upon which line mark the height of the cube, equal to the length of one of its ſides, in the plan, as O P. Then are all the neceſſary ſteps taken for obtaining the repreſentation required; which is done by drawing the lines O V and P V (Fig. 3.) *a* Z and *e* Z; *f* V and *c* Z, cutting each other in the point *d*, and completing the figure *a b c d f g*. Which figure will be the repreſentative figure of a cube, as it would appear to an obſerver regarding it ſituated on the ſquare A B C D, (Fig. 1.) whoſe eye was one inch and a half above the point S.

If the drawing upon the plane G H K L (Fig. 3.) was placed perpendicularly over the line G L, as is done (Fig. 4.) by turning the moveable plane G H K L upright on the line G L, the relation it then has to the ground plan will be more clearly diſcernable, and the united operations and coincidence of both, more readily ſeen; and where it may be noticed that were the figure *a b c d f g* cut out, a ſolid cube ſtanding on the ſquare A B C D, would appear exactly to fit the aperture, to the eye of a perſon elevated, one inch and a half over the point S, with his eye oppoſite the point O in the horizon.

DEFINITIONS.

11. **Ground Plane.** Is the plane upon which the *Objects* to be drawn are placed; as alſo whereon ſtands the *Obſerver* and *Plane of Delineation.*

N. B. The *Ground Plane*, in perſpective enquiries, is conſidered an infinitely extended level, or horizontal, plane.

12. **Ground Line.** Is the line in which the *Plane of Delineation* reſts on the *Ground Plane.*

13. **Station Point.** Is a point on the *Ground Plane* perpendicularly under the *Point of Sight*, or *Point of View.*

In the proceſs of perſpective delineations, the horizon, or horizontal line, is a conſideration of the greateſt importance, inaſmuch, as it regulates

PLATE VI.

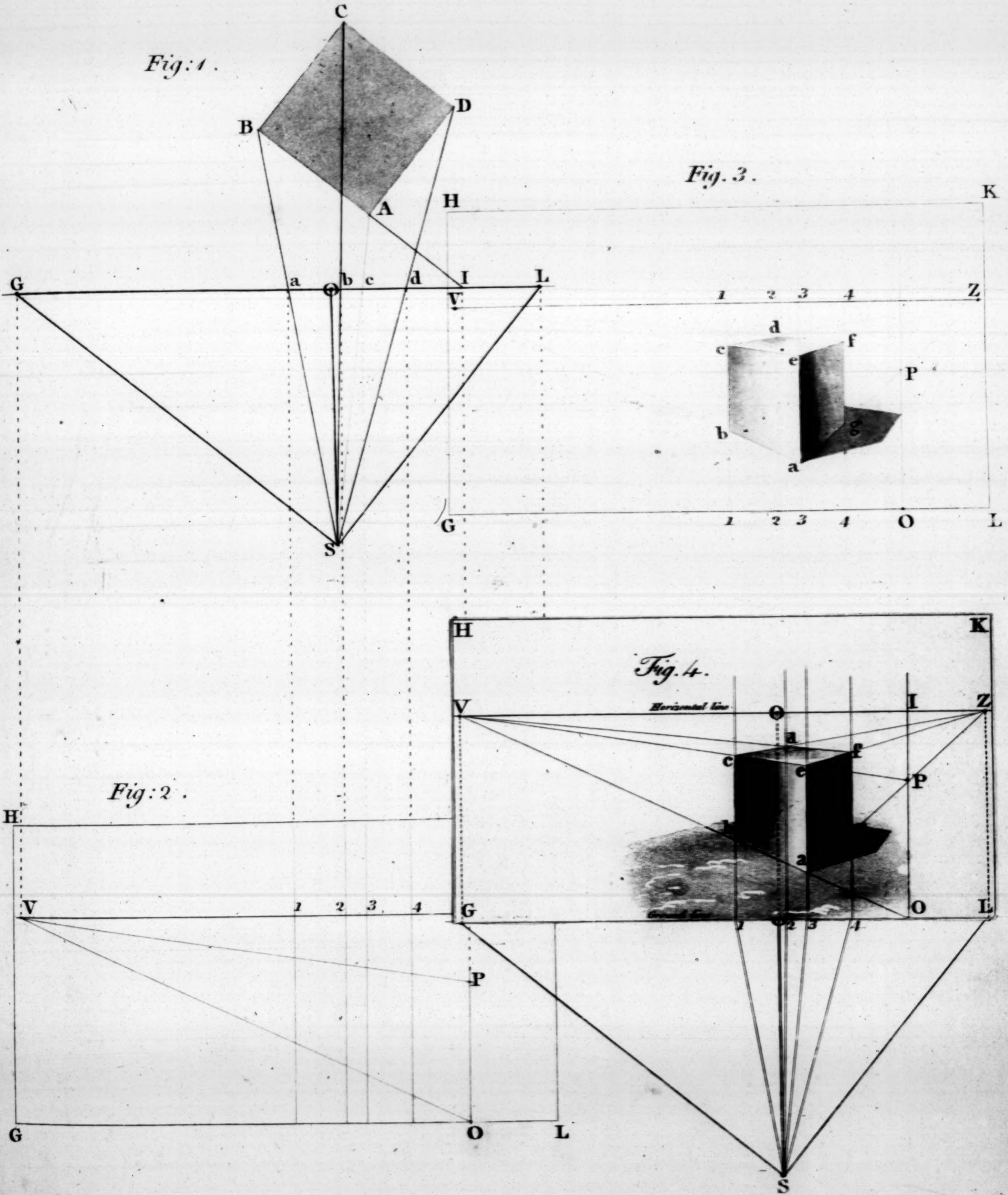

Fig: 1.

Fig: 2.

Fig. 3.

Fig. 4.

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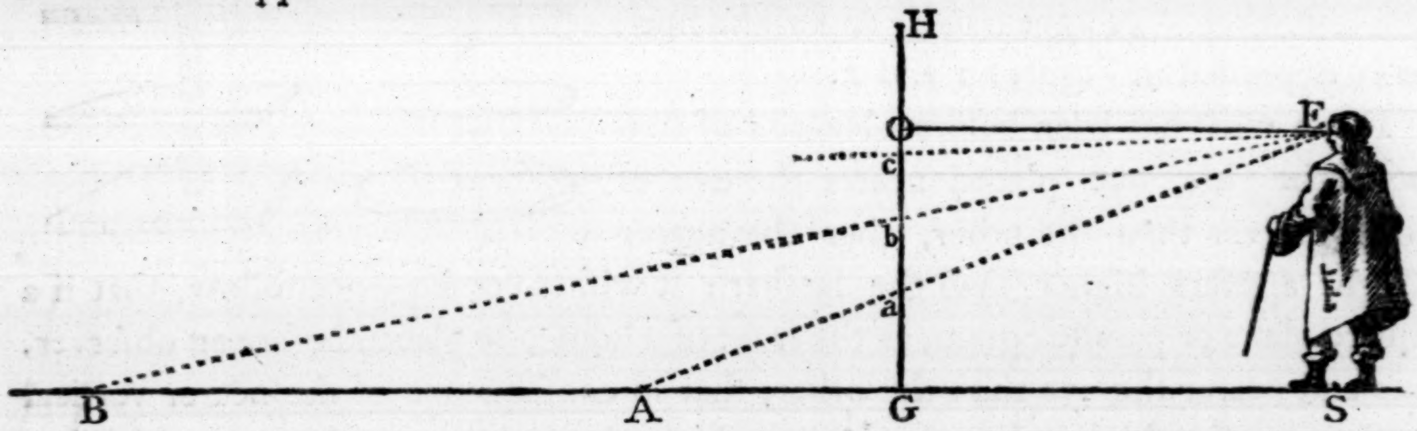
and governs every part of the work, whether it be the repreſentation of buildings, or human figures, or both, or with numerous other objects combined. Accordingly as the *horizontal line* is placed higher or lower, does the drawing of the whole picture vary, the entire of the work being governed by it.

Between the *Horizontal line* and the *Ground line,* or bottom edge of the Picture, is comprehended the repreſentation of infinity of level ground; that is, were the *Ground plane* to be infinitely ſtretched out, beyond the plane of delineation, it would all appear under the horizontal line.

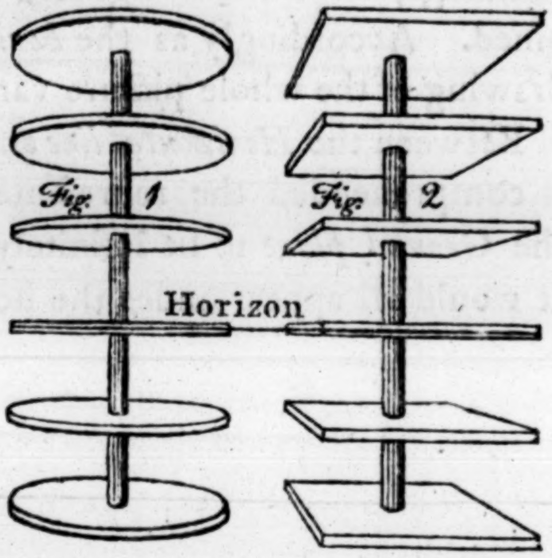


Let the line A S repreſent a ſection of the ground plane; and let G H repreſent a ſection of the plane of delineation: let E be the place of the eye of an obſerver; S will, of conſequence, be the ſtation point. Draw the line E O parallel to A S, cutting the line of the picture G H, in the point O, the place of the Horizontal line; *then will the ſpace between G and O, on the picture, or plane of delineation, be the repreſentation of the level ground plane, continued infinitely towards B, beyond the plane of the picture.*

The ſpace of ground from G to A, is a certain diſtance; by drawing the viſual ray A E, the plane of delineation is cut in the point *a*, giving the ſpace *a* G for its repreſentation on the picture. Suppoſe the repreſentation of a greater length were required, as G B; the viſual ray B E being drawn, determines and gives *b* G for its repreſentation on the picture; and ſo on of any length that might be required, it would always be obtained by drawing a viſual ray from the diſtance deſired, to the eye, cutting the picture; but no point on the ground line could be ſo far diſtant, that a viſual ray from it could fall in with the line O E, becauſe the line O E is parallel to the ground line. Did the line of viſual ray, as E *c*, differ but ever ſo little from the line O E, it would if produced, ſomewhere cut the ground line S B, lengthened out; but no point, however far diſtant, could be aſſumed in the ground plane, that a viſual ray from it could fall in with the line O E; becauſe two parallel lines, though produced infinitely, could never meet;

wherefore the ſpace between G and O, as was advanced, comprehends the repreſentation of infinity of level ſpace under the horizon.

When any level plane is below the horizon, then the top of it is ſeen; the more it is depreſſed below the horizon, the more is its true figure diſcernable; as alſo will be the caſe the more it is elevated above the horizon; and when a level plane is in the plane of the horizon, then is its appearance but a right line; as is expreſſed in Figures 1 and 2.



From what has been before obſerved of two equal heights, one placed nearer the eye of the obſerver than the other, that the nearer height appears higher than the farther; it will of conſequence follow, that if a ſquare plane or parallelogram, as the front of a houſe, be placed before an obſerver, one end nearer the eye than the other, that in conſequence of the nearer vertical angle appearing higher than the farther, the horizontal lines of the top and bottom will appear to decline towards one another, on the ſide of the farther angle; and muſt of courſe, if continued in the repreſentation, meet in a point. Theſe points of union or meeting of inclined lines, have been denominated by the beſt writers on perſpective, the vaniſhing points of thoſe apparently inclined lines.

DEFINITIONS.

14. **Vanishing Point,** Is a point on the plane of delineation, which is the point of union or point of convergency that two or more lines will have, which are the repreſentations of two or more parallel lines in an original object, placed inclined to the plane of delineation.

This definition and the following (the 15th) and all the obſervations relating to them, ſhould be carefully and thoroughly conſidered; as the juſtly underſtanding of them is matter of the utmoſt importance: 'tis therefore, that the Student is requeſted to be particularly earneſt in the conſideration of them, and if not fully comprehended on a firſt peruſal, to read them over again and again, and ponder on them, till they are thoroughly conceived.

15. **Vanishing Line,** Is a line on the picture, or plane of delineation, ſuppoſed obtained by a plane paſſing through the eye, *parallel* to any plane in an original object, and produced until it cuts the picture.

Conſequently the *Horizontal line* is the *Vaniſhing line* of all horizontal planes; and all horizontal lines, or lines laying in horizontal planes, will have their *vaniſhing points* in the *horizontal line*.

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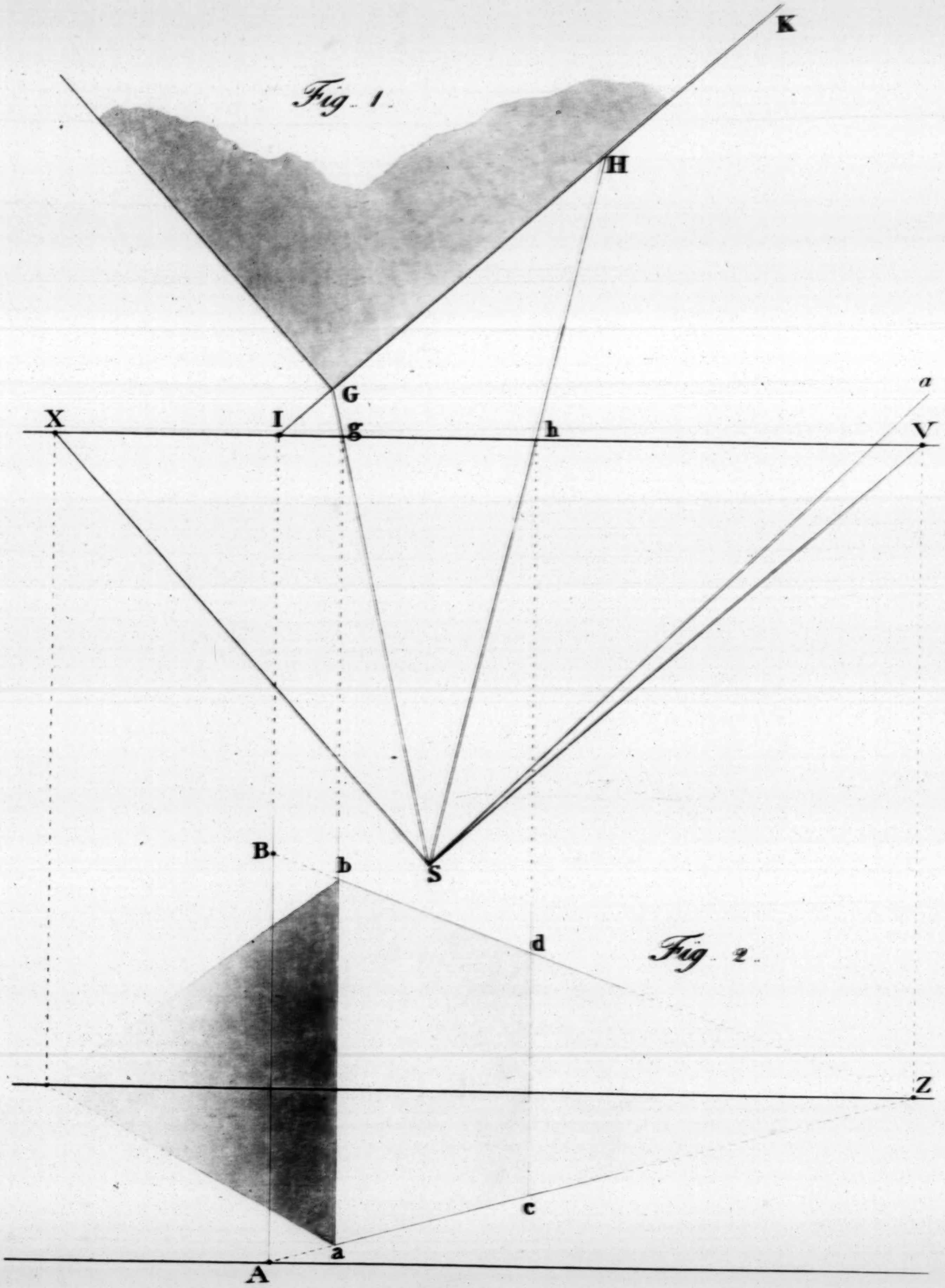
PLATE 7

Fig. 1.

Fig. 2.



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And the *vaniſhing points* of all lines whatever, will be ſomewhere in the lines that are the *vaniſhing lines* of the planes thoſe lines are in.

And farther, all parallel lines in an original object or objects, that are ſituated *parallel* to the plane of delineation, can have no vaniſhing point, but muſt all, as are the originals, be drawn geometrically parallel, on the plane of delineation.

To find the vaniſhing point of a line, inclined to the plane of delineation; draw a line from the eye of the obſerver, parallel to the line of which the vaniſhing point is required, till it cuts the picture or plane of delineation; the point wherein it touches the picture is the vaniſhing point of that original line, and of all lines parallel to it.

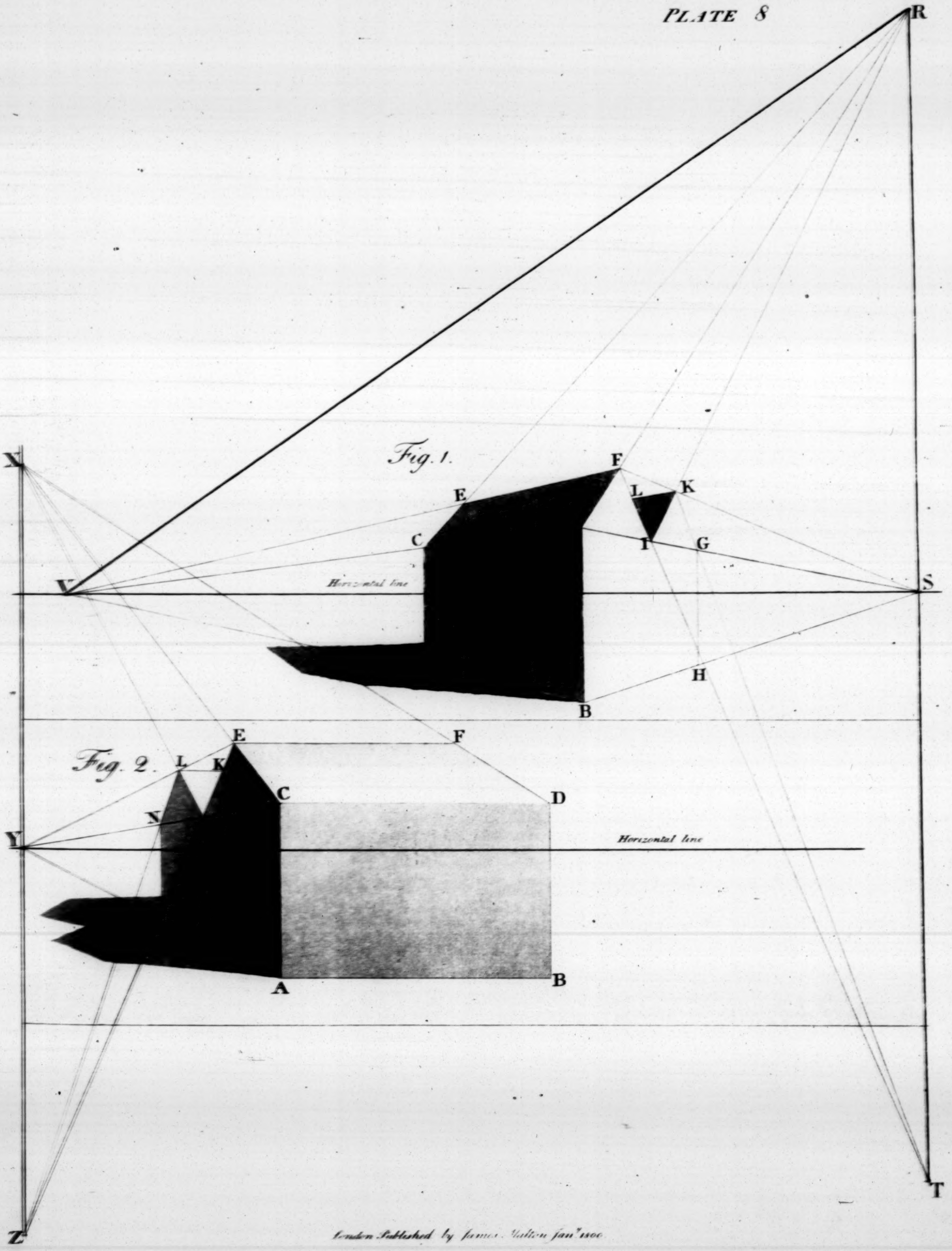
Let the line GH (Fig. 1. Plate VII.) be the direction of a front of a building on the ground plane, ſtanding inclined to an obſerver at the ſtation S; and let the line XV be the direction of the plane of delineation; draw SV parallel to GH; alſo draw the viſual rays SG, SH. It muſt be clearly evident that the angle of the front of the houſe, ſtanding perpendicularly over the point G, will appear higher than the equal height at the farther angle, over the point H; of conſequence, the top and bottom horizontal lines of the building will appear inclined, and to have a tendency towards each other on that ſide where the upright angle appears the leſſer, and therefore muſt be ſo repreſented on the plane of delineation. The point wherein they would meet, if produced, would be a point in the horizontal line perpendicularly over the point V in the ground line, at the height of the eye of the obſerver, as is expreſſed by the point Z, in the Diagram below, (Fig. 2.) and which point is obtained by being the interſection of a line drawn from the eye parallel to GH, (Fig. 1.) produced till it touches the plane of delineation XV, in the horizon at V. *Which point would be the point of their tendency, and comprehends infinity of ſpace between it, in the horizon, and the point* I, *the interſecting point of the line* GH *produced till it cuts the ground line*. The angle G will appear to interſect the plane of delineation in the point g; and the angle H will appear to do the ſame in the point h; and the apparent height of each, according to any fixed height of the building, is determined as in the diagram below. Where, the height being ſet up on the interſecting line of the building, AB, and lines being drawn from thoſe points to the vaniſhing point Z, determines the heights ab and cd, as the apparent and comparative heights of the two extreme angles of the building; and the whole plane, were it continued on infinitely, would concentre and vaniſh in a point; as at Z.

For however extended might be the line G H towards K, a viſual ray could not be drawn from any point of the extended line G K that could poſſibly fall in with the line S V, becauſe the line S V is parallel to G K. Wherefore the ſpace from I to V, is the repreſentative ſpace on the plane of delineation, for the infinite extention of the plane over the line G K. How trifling ſoever might be the variation of the viſual ray, as S *a*, from the line S V, were S *a* produced, it would ſomewhere meet the extended line G K, which could not be the caſe with the producing of the line S V, becauſe it is parallel to G K; and parallel lines, though produced infinitely, will never meet.

A full illuſtration of all the foregoing obſervations and concluſions will be found on ſurvey of the figures, Plate 8, where may be obſerved (Fig. 1) that the lines A B, C D, E F, and L K, being the repreſentations of parallel lines, the originals of which were in planes inclined to the plane of delineation, have the ſame vaniſhing point, V; and being the repreſentations alſo of horizontal lines, have their *vaniſhing point* in the *horizontal line*. The lines F K, D G and B H, being alſo the repreſentations of parallel lines, have likewiſe a common point of tendency, or vaniſhing point, S; and, as before, being all horizontal lines, have their vaniſhing point in the horizontal line, which is the vaniſhing line of all horizontal planes, conſequently all lines laying in horizontal planes have their vaniſhing points in the horizontal line. Upon the ſame reaſoning the lines C E, D F and I K, being alſo the repreſentations of parallel lines, have, in conſequence, a common vaniſhing point, as R; and the parallel lines F I and K G, have a like mutual tendency in the point T. But it may be remarked that the horizontal lines F K, D G and B H, and the inclined lines D F, I K and F I and K G are lines all in the ſame inclined plane B D F I K G H; wherefore, agreeably to the principles before ſtated, that the vaniſhing points of all lines laying in the ſame plane, will be ſomewhere in the vaniſhing line of that plane; thoſe three different inclinations of lines will have their vaniſhing points in the ſame right line: ſuch may be obſerved is here the caſe. The line RST is the vaniſhing line of the plane B D F I K G H; being the line that would be obtained by a plane through the eye parallel to the original plane, of which that is the repreſentation, and producing it until it would cut the picture, and the three vaniſhing points of the three different directions of the lines in that plane, are all in that line, as R, S and T.

The line R S T is not the vaniſhing line of the plane B D F I K G H only, it is the vaniſhing line alſo of all planes parallel to that plane; and is there-

PLATE 8



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ſore the vaniſhing line of the parallel end of the ſame houſe, and all lines laying in that plane will have their vaniſhing points ſomewhere in that line; ſuch is the caſe with the line C E, which has its vaniſhing point at R; for the lines CE and DF, are parallel lines, and though the boundaries of different planes, they are alſo in the ſame plane, DCEF; and will therefore have a common vaniſhing point; which they have, at R.

Fig. 2. is another repreſentation of the above object, but with this difference of poſition, that one plane of the houſe is conſidered as having been placed parallel to the plane of delineation; wherefore the lines A B, C D, E F and L K being all parallel to the plane of delineation, will have no point of declination, or common tendency, but will all be drawn geometrically parallel to each other. But the lines L E, N C and O A being perpendicular to the plane of the picture, becauſe at right-angles with the others, will have their point of tendency directly oppoſite the point of view, or point of ſight; becauſe, on the principle of finding the vaniſhing point of lines, by a line being drawn from the eye, to the picture, parallel to them, it will of courſe be there, as at Y; and a vertical line through Y, will be the vaniſhing line of the plane O N L M E C A. The ſlant lines of the roof F D, E C, and L M, being parallel, though in different planes, will have a point of common tendency in the ſame vaniſhing line, as X; as will alſo the parallel lines L N and E M, at Z.

Thus I have brought the inveſtigation of my ſubject to an end; and ſhall here conclude what I may term a whole, but brief theory, of perſpective delineation on planes. I do not however imagine it will be thoroughly comprehended, on a firſt peruſal, by thoſe who were before totally unacquainted with the ſubject; nor do I conſider it will on a ſecond, without ſome practice; but which, I make no doubt, before having gone through the following work of practice, will be clearly and fully underſtood.

PRACTICAL GEOMETRY.

PREVIOUS to entering on the Practice of Perſpective Delineation, it is requiſite that the ſtudent be acquainted with a ſufficiency of practical geometry, to be enabled to execute, without delay, what may be required in the proceſs of perſpective drawing. In this ſection have been collected ſuch problems on that ſubject as are abſolutely neceſſary; they are of general uſe, and the moſt facile conſtruction of them has been carefully endeavoured. Should practical geometry be already familiar to the reader, this diviſion may be paſſed, only performing the laſt requiſition, as it contains the principal preliminary ſteps relative to the operative lines for finding the perſpective forms of objects from determined ſtations.

To know ſomething of angles, their kinds, how to eſtimate their magnitude, and compare them to each other, is not only requiſite in moſt mathematical reſeaches, but of advantage even in the common purpoſes of life.

By an ANGLE, in geometry, is meant the inclination, or the mutual tendency, which two lines have to each other that touch at one extreme, and then ſeparate, leaving a ſpace between them.

Mathematicians refer to a line, or to many lines, by letters, or other ſymbols, being placed at their extremes; and identify them, by calling them the lines of ſuch ſymbols or letters; as of the three lines, Fig. 1, which may be denoted the lines AB, CD, and EF. By this ſimple means diſtinct reference is made to different lines where many are confuſedly mixed together; and inferences and conſequences are drawn relative to them, with the utmoſt perſpicuity and exactitude; as of the three lines AB, CD, and EF; aſſerting, that if the line AB is longer than CD, CD is alſo ſhorter than EF, EF being longer than AB. Or, it may be ſaid, that the line AB is parallel to EF, and that CD is inclined to them both. An angle is referred to by three letters, or other ſymbols; one being placed at the vertex, or junction of the two lines forming of it; as H, Fig. 2, and one at each other extreme of the lines, as G and K; to nominate which angle, and convey a ſenſe of the ſame to others, it is read the angle GHK, or KHG, always naming the letter at the vertex of the angle, between thoſe which refer to the other extremes of the lines.

Fig. 1

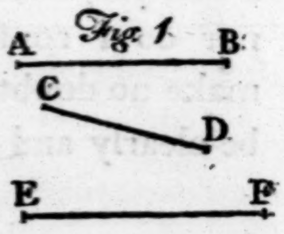

Fig. 2

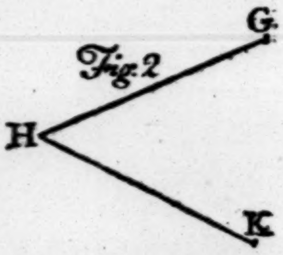

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PLATE 9

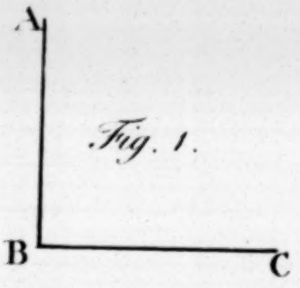

Fig. 1.

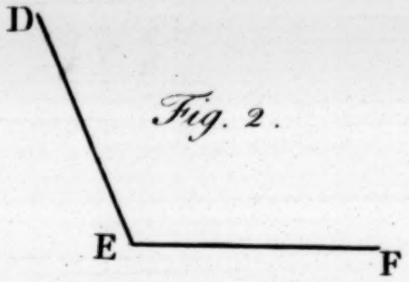

Fig. 2.

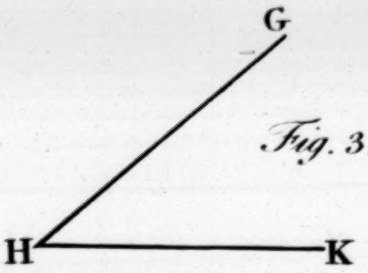

Fig. 3.

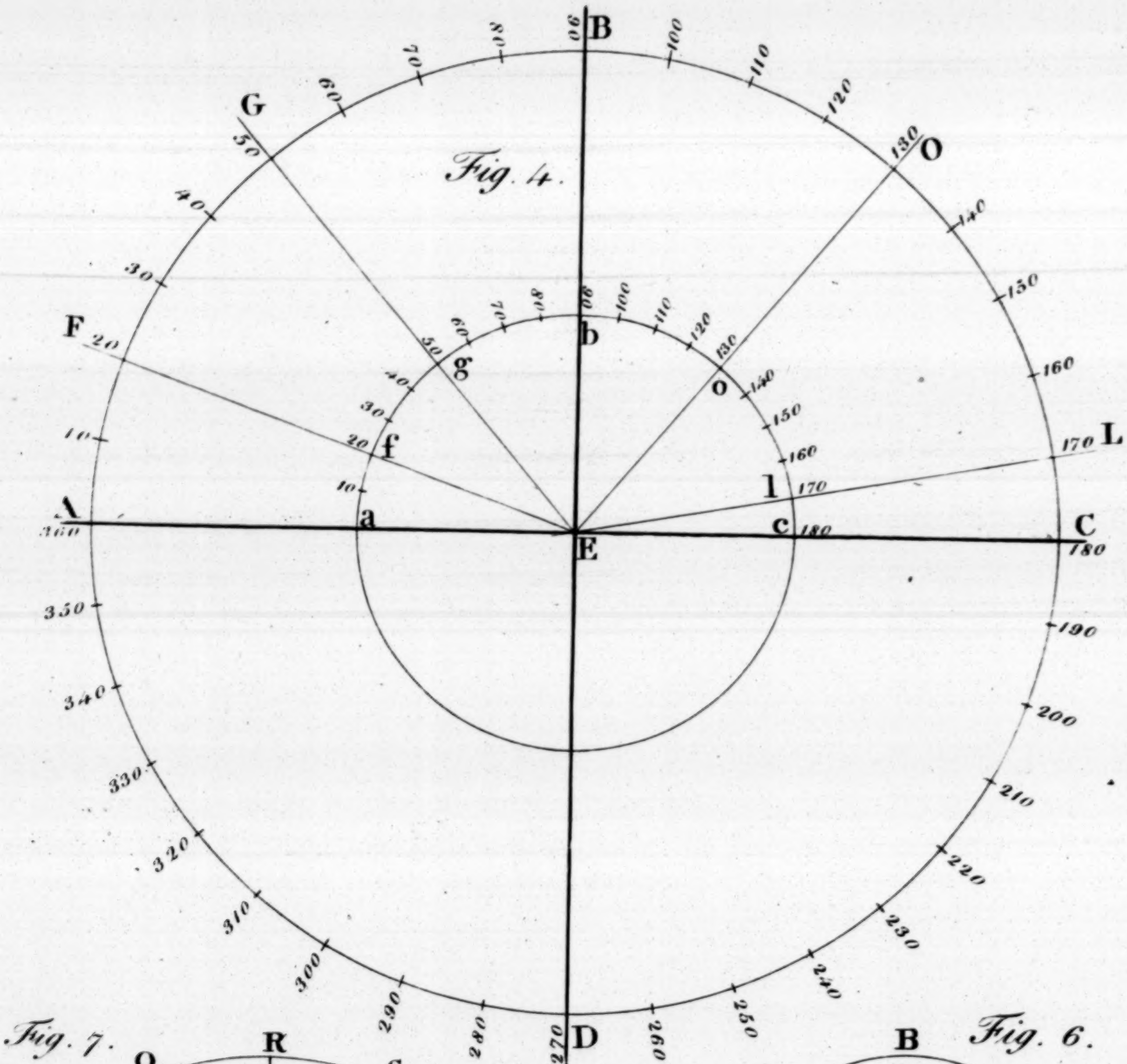

Fig. 4.

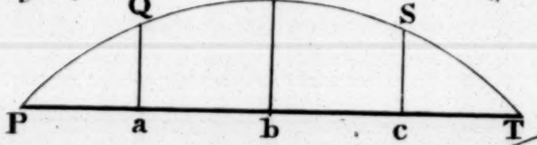

Fig. 7.

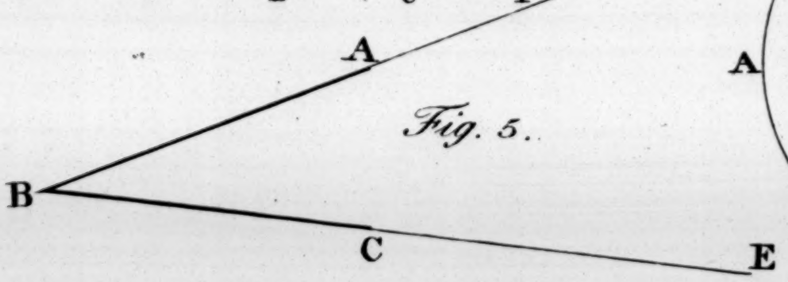

Fig. 5.

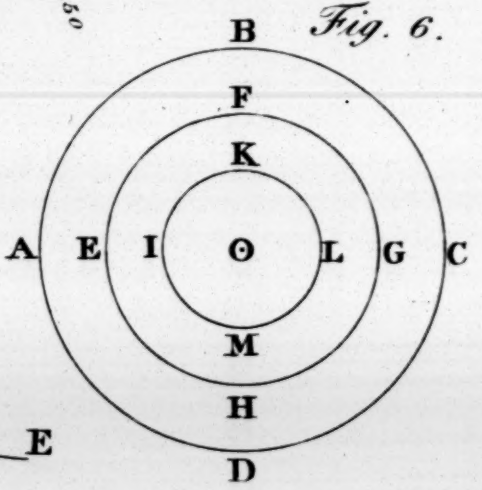

Fig. 6.

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Angles, formed by right lines, are of three kinds only; *viz*. Right Angles, Obtuſe Angles, and Acute Angles. When one of the lines forming of an angle is perpendicular to the other, then is ſuch an angle ſaid to be a right angle; ſuch is the angle A B C, Fig. 1, Plate 9, the line A B being perpendicular to the line B C. When the lines have a greater degree of expanſion than a right angle, ſuch an angle is ſaid to be an obtuſe angle, as the angle D E F, Fig. 2; and when they have a leſs degree of expanſion than a right angle, ſuch an angle is ſaid to be acute, as the angle G H I, Fig. 3. [Plate 9.]

The magnitude of an angle is computed by the portion it comprehends of a circle, uſing the angular point as the centre to revolve the circle upon. For the general admeaſurement of angles, the circumference of a circle is divided into 360 equal parts, called degrees; a diviſion univerſally aſſented to; and an angle is ſaid to contain, or to be an angle of as many degrees as fall within the expanſion of the two lines.

If two lines, one perpendicular to the other, croſs each other, there are formed four angles, all right angles. By the croſſing of the perpendicular lines AC and B D, (Fig. 4.) there are formed four right angles, and uſing the point of their common interſection, E, as the point to revolve a circle around upon, each angle will of courſe contain a quarter of that circumference; and the whole circumference being divided into 360 equal parts, each right angle, (all right angles being equal,) muſt contain a quarter of 360, that is 90 degrees. A right angle is a determinate one, and there can be no variety of them; but of obtuſe and acute angles there may be many, of various magnitudes.

The circle ABCD, Fig. 4, is divided into 360 equal parts. The angle AEF, is an acute angle of 20 degrees; the angle AEG an acute angle of 50 degrees; and ſo on to any number ſhort of 90. The angle AEO is an obtuſe angle of 130 degrees, and the angle AEL an obtuſe angle of 170 degrees, and ſo on to any number ſhort of 180, at which period the expanſion of the two lines would fall into one right line, as AEC. For the greater accuracy, in the eſtimating of angles, each degree is ſubdivided into 60 equal parts, called minutes; and each minute into 60 equal parts, called ſeconds; ſo the meaſurement of an angle may be a certain number of degrees, minutes, ſeconds, thirds, &c.

An angle is not enlarged by lengthening of the lines forming of it; for the angle ABC (Fig. 5.) is ſtill the ſame and not at all increaſed by extending of the lines to D and E. An angle is eſtimated only by the degrees of incli-

[Plate 9.] nation which one line forming it has to the other; and that inclination is not increaſed by lengthening of the lines; for the line DB has no greater, but the ſame inclination to AB that any portion of the line has; and the angle DBE and ABC are one and the ſame angle, and would ſtill be ſo were the lines lengthened out infinitely.

This may be more clearly perceived in Fig. 4, where the angle aEf is the ſame with AEF; and aEg with AEG, &c. For, each contains ſimilar portions of the curve of their reſpective circles; conſequently an equal number of degrees. By attentively examining the figure, it will be fully comprehended that the magnitude of angles is affected only by the degree of inclination which the lines have to each other, however ſhort they are, or however long.

It is not my intention to give a complete ſyſtem of Practical Geometry; that would form an extenſive work of itſelf. I purpoſe to give only that ſufficiency of it as will enable the Student in Perſpective to draw his figures on true principles, and correctly.

A POINT may be defined to be the extremity of a line; a LINE, curved, or ſtraight, the extremity of a ſurface; and a SURFACE, plane, or irregular, the boundary of a ſolid.

A RIGHT LINE, is the ſhorteſt line that can be drawn between two extreme points. A CURVED LINE, is a line that lays indirect between its extreme points. Lines are ſaid to be PARALLEL when the perpendicular diſtance between them is in every part equal. Curved lines are parallel when they are oppoſite portions of concentric curves; and CONCENTRIC CIRCLES are ſuch as are ſtruck upon a common center; as are the circles ABCD, EFGH, IKLM, Fig. 6. being ſtruck upon the common center O. In which circles, the portions BC, FG, and KL, are parallel.

An ARC is any portion of a circle, as the arc PQRST, Fig. 7.

A CHORD of an arc, is a right line drawn from one extent of an arc to the other, as the line PT of the arc PQRST, Fig. 7.

An ORDINATE, or ORDINATES, is a line, or any number of lines, dropped from an arc, or curved line, perpendicularly to the chord of that arc, or curved line, as the lines Qa, Rb, Sc, Fig. 7. which are dropped from the curve PQRST perpendicularly to the chord PT.

An ANGLE has already been defined; page 18.

Problem I. To make an angle equal to a given angle, from a given point, in a given line. [Plate 10.]

ABC, [Prob. 1. Plate 10.] *is the given angle, and* E *the given point in the line* EF[a].

With one leg of the compaſſes fixed on the vertex B, of the given angle, with the other deſcribe the arc AC; with the ſame extent of compaſſes, and with one leg fixed in the given point E, deſcribe the arc, FD, indefinite; then extend the compaſſes from A to C, and apply that meaſure from F to D, making the arc F D equal the arc A C; draw the line E D, then will the angle DEF, be equal to the angle ABC.

Note. For greater accuracy in meaſuring, or making equal angles, let the expanſion of the compaſſes be as great as the angle to be meaſured, or the compaſſes will well allow.

Prob. II. To draw a line from a given point, parallel to a given line.

GH *is the given line, and* I *is the given point.*

From the given point I, draw a line as I H at pleaſure, touching the given line, in a point at H; make the angle H I K, equal the angle G H I, by Problem I, and the line IK will be parallel to the line GH.

Prob. III. To biſect, or to divide, a given line into two equal parts.

LM *is the given line.*

With an extent of compaſſes greater than half the given line, on each of its extremes L, and M, deſcribe two arcs croſſing each other in the points a and b; draw the line a b which will biſect, or divide the line LM into two equal parts.

Prob. IV. To biſect, or divide, any given angle into two equal diviſions.

NOP *is the given angle to be divided.*

On the vertex O of the given angle, deſcribe an arc, as NP; with the ſame or any extent of compaſſes greater than half that arc, on the points N, and P, deſcribe two arcs interſecting each other at c; then draw the line O c, which will biſect the angle NOP.

Definition. *A right line is ſaid to be perpendicular to another right line when it does not incline to either ſide, but makes a right angle on both ſides of the line. And this, be the two lines poſited as they will, without regard to what is really horizontal or vertical.*

---

[a] Throughout theſe Problems, the given requiſites, ſuch as lines, angles, &c. are drawn with ſtout lines; the operative lines, or lines of the proceſs, are all dotted; and the required lines, or the lines obtained, are expreſſed by fine lines.

[Plate 10.] PROB. V. To draw a right line perpendicular to a given right line, from a given point in that line.

RS *is the given line, and* T *is the given point.*

On each ſide of the given point T, ſet off equal meaſures, as TR, and TS; then, with any greater meaſure in the compaſſes, on the points R, and S, deſcribe two arcs interſecting each other in the point d; draw the line dT, which will be perpendicular to the line RS.

PROB. VI. At the extreme point of a given right line, to draw another right line perpendicular to the given line.

VX *is the given line, and* X *the given point.*

Aſſume any point, as the point e, at pleaſure, but let it be ſomewhere about midway between the line given and the line required, and fixing one leg of the compaſſes in that point, extend the other to the point X, from whence the perpendicular is required, and draw the curve VXZ indefinite; then applying a ruler to the points e, and V, where the curve touches the line VX, draw the right line VeZ, touching the other extreme of the curve in the point Z, and draw the line XZ which will be perpendicular to the line VX.

The foregoing propoſition is a very uſeful one, and worthy of particular conſideration. If from each extreme of the diameter of a circle, lines be drawn meeting in the circumference, the angle that would be formed, would be a right angle; and of conſequence the lines one perpendicular to the other. Thus in the ſemicircle ABCDE, Fig. 7, if two lines AB and BE, be drawn, meeting in the point B, *the angle made, the angle ABE, will be a right angle: alſo the angle ACE is a right angle, ſo is the angle ADE; and ſo would any angle be which extended the diameter, and whoſe vertex touched the circumference.*

In Problem VI. before performed, the curve VXZ is a ſemicircle, of which VZ is the diameter; and the angle VXZ is an angle extending the diameter, and whoſe vertex touches the circumference, conſequently the angle VXZ is a right angle.

PROB. VII. To draw a line perpendicular to a right line, from a given point out of that line.

FG *is the given line, and* H *is the given point.*

On H, the given point, with any opening of the compaſſes greater than the diſtance of the line, draw an arc, as FG, cutting the given line in the two points

F and G. Then with the ſame, or any opening of the compaſſes greater than half the ſpace between the two points F and G, deſcribe two arcs on the other ſide of the line, interſecting at f, and draw fH, which will be perpendicular to FG. [Plate 10.

PROB. VIII. To divide a line proportionally, as another is divided.

IK *is the line required to be divided in the ſame parts, proportionally, as is the line* LM *in the points* g *and* h.

Place the two lines parallel to each other, and at any diſtance at diſcretion, as *IK*; draw the lines L*I* and MK, touching the extremes of the given lines, and produce them till they meet in the point N; then draw the lines hN and gN, cutting the line *IK* in the points i and k, the points required. The diviſions made on the line *IK* will be proportionally to each other, and to the whole line, as are the diviſions in the line LM, to one another, and to the whole line.

DEF. A SQUARE *is a Quadrilateral whoſe oppoſite ſides are equal and parallel, and its four internal angles all right ones.*

PROB. IX. To conſtruct a Square on a given line. OP *is the given line.*

On either extreme of the given line, O or P, ſuppoſe O, draw a perpendicular line, as OR, (Prob. VI) make the line OR equal to the line OP, and with the ſame meaſure in the compaſſes, on the points P and R, draw two arcs interſecting each other at S; then draw the lines SR and SP, which will complete the Square ORSP.

DEF. A REGULAR HEXAGON, *is a ſix equal ſided right lined figure, having ſix internal angles, which ſhould alſo all be equal.*

PROB. X. To conſtruct a regular hexagon on a given line, for a ſide.

TV *is the given line, for a ſide of the hexagon.*

On the two extremes of the given line T and V, with the length of the line TV in the compaſſes, deſcribe two arcs, as TmW, and VmZ, interſecting each other at m; on which point m, with the ſame meaſure in the compaſſes, deſcribe the circle TZXYWV, and ſtill with the ſame meaſure, on the points Z and W, mark the circle in the two other points X and Y, and draw the lines TZ, ZX, XY, YW and WV, which will complete the hexagon TZXYWV.

Note, a ſide of a regular hexagon, is the chord of the ſixth part of the circumference of a circle circumſcribing of it.

DEF. A REGULAR OCTAGON, *is an eight equal-ſided, right lined figure, having eight internal angles, which ſhould alſo all be equal.*

[Plate 10.] **Prob. XI.** To conſtruct a regular octagon, on a given line, the dimenſion of one of its ſides.

AB *is the given line for the ſide of an octagon.*

Produce, or lengthen, the line AB, both ways, towards I and K, and on the points A and B, draw the perpendiculars AE and BF indefinite (Prob. V.) Biſect the right angles EAI and FBK (Prob. IV.) by the lines AC and BH, which lines make each equal to the given ſide of the octagon AB. Draw CD and HG parallel to AE and BF, and make them alſo each equal to AB; laſtly, make the lines AE and BF, each equal to CH, and draw the lines DE and FG, which will complete the octagon A C D E F G H B.

As an octagon is a figure of very frequent occurrence in buildings, often forming the ground plan of apartments, and, as commonly as the circle, ſhaping the bows or projecting ends and ſides of rooms; I have deſire therefore, to give as correct and expeditious ways of conſtructing it, as poſſible, and probably the following may be found more ſo, than the one juſt deſcribed, when ſuch method can be followed.

Note.—It often happens that an octagon is required to be conſtructed in a given ſpace, that is, its diameter or breadth is given, and not a ſide. When that is the caſe, the buſineſs is ſoon accompliſhed, by firſt making a ſquare of the diameter, and proceeding as follows.

Prob. XII. To conſtruct an octagon on a given line, its diameter or breadth.

LO is the given line for the diameter of an octagon.

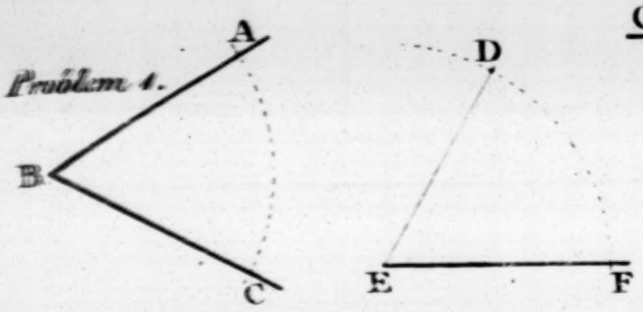
On the given line LO firſt conſtruct a ſquare (Prob. IX.) as LMNO, and draw the diagonals LN and MO, interſecting each other in the point k; then on the four angles of the ſquare, with the meaſure of one half of a diagonal in the compaſſes, deſcribe the four arcs ckh, bke, dkg, and fka, cutting the ſides of the ſquare in the points abcdefg and h; laſtly, draw the lines ab, cd, ef, and gh, which will form and be ſides of the octagon required, abcdefgh.

If from any point within a triangle, two right lines are drawn to the extremes of any ſide of that triangle, thoſe lines form a larger angle than the remaining two ſides of the triangle.

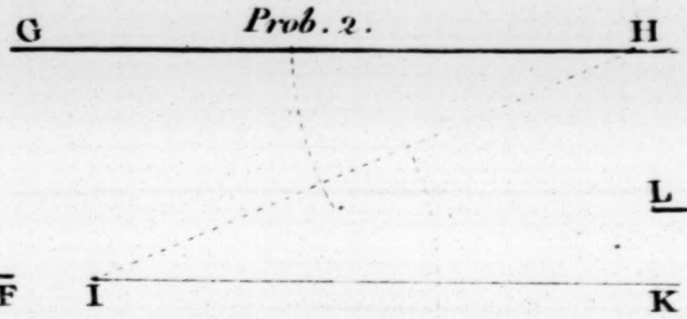
In the triangle ABC, (Fig. 13) let a point, as D, be aſſumed, and draw the lines DB and DC; then will the angle BDC, be greater than the angle BAC. By drawing the lines AE and AF, reſpectively parallel to the lines DB, and DC, the circumſtance will be manifeſt, for the angle E A F is equal the angle B D C, the lines being parallel; but the angle AEF is greater than the angle BAC, which expands but the portion from a to b of a circle meaſuring of it, while the other extends from c to d; wherefore the angle B D C, equal the angle E A F, is greater than the angle B A C; agreeably to the premiſes ſtated.

PRACTICAL GEOMETRY

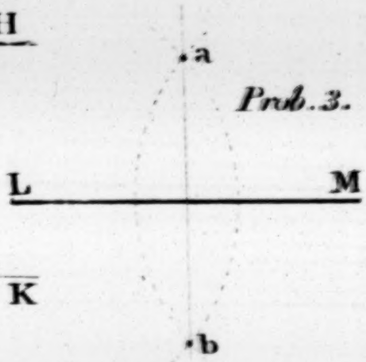
Problem 1.



Prob. 2.



Prob. 3.



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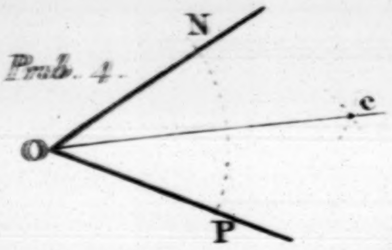
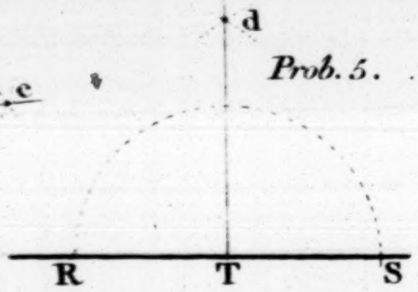


Prob. 5.



Prob. 6.

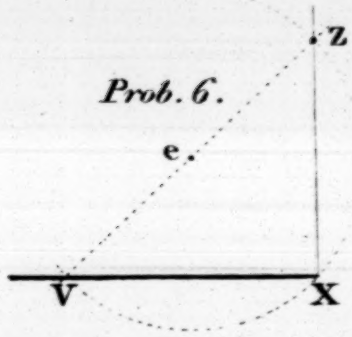
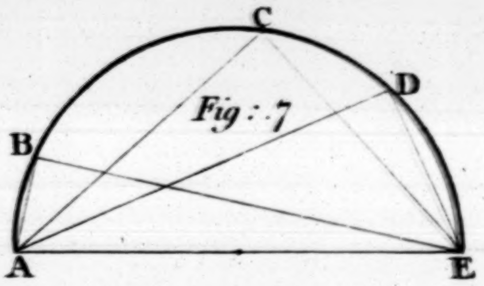


Fig: 7



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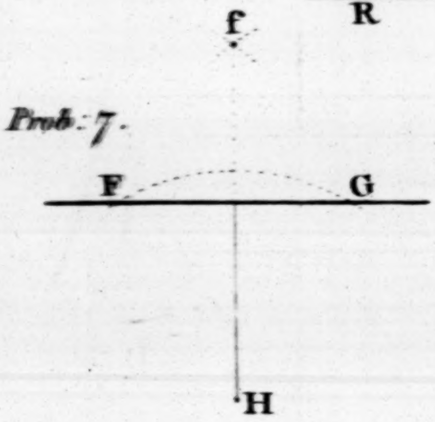

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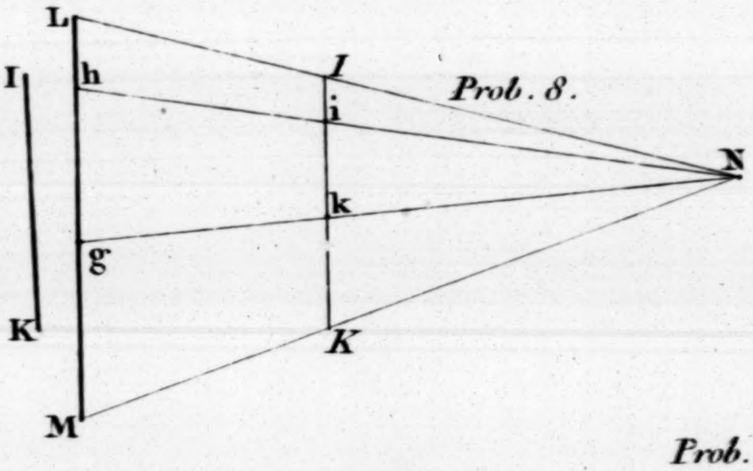

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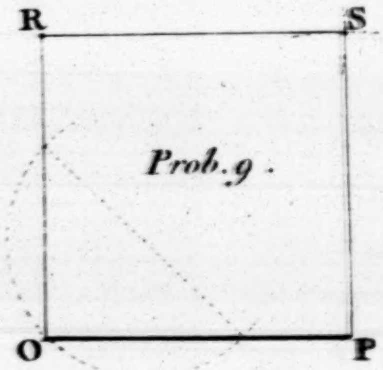
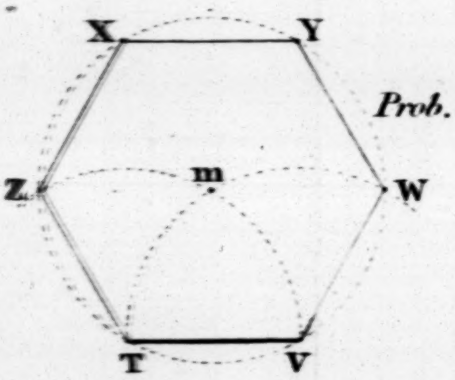
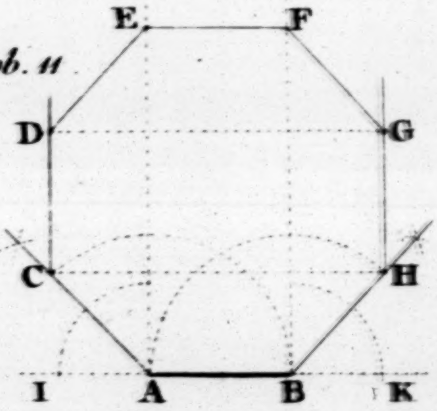


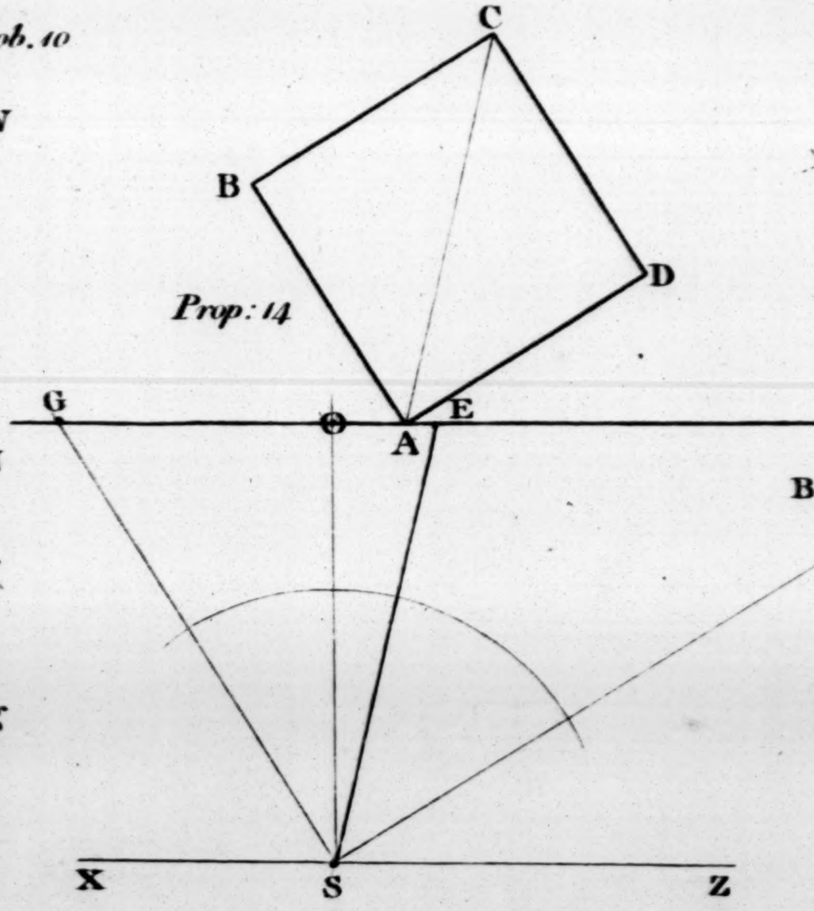
Prob. 10



Prob. 11



Prop: 14



Prob. 12.

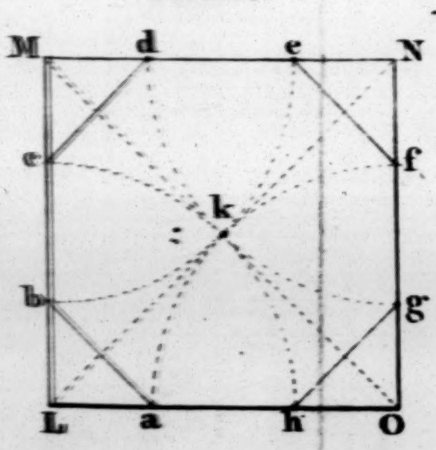
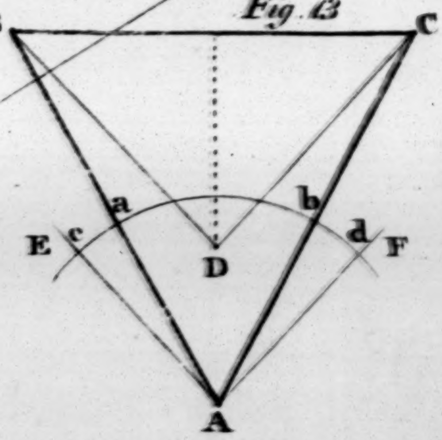


Fig. 13



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Theſe are all the geometrical problems I think neceſſary to the proſecuting of [Plate 10.] practical perſpective delineations; ſhould the ſtudent wiſh for farther, or more complete information, on this ſubject, I muſt refer him to the Work publiſhed by my Father, entitled, "A ROYAL ROAD TO GEOMETRY;" where will be found a complete body of Geometry, both elementary and practical, fully and clearly inveſtigated; and alſo a comprehenſive and brief theory of menſuration of ſuperficies and ſolids, with ſome of the moſt commonly uſeful properties of the ellipſis or oval, pleaſingly illuſtrated.

PROPOSITION 14. Draw the following perſpective ſcheme.

As a confirmation of acquaintance with practical Geometry, and of the uſe of the compaſſes, it is required to draw the following ſcheme, which muſt be done with facility, as it is the previous ſtep to drawing any regular perſpective delineation, according to the practice of the following work.

On a given line, as A B, conſtruct a ſquare, as A B C D, (Prob. 9) draw a line G L, at pleaſure, touching the angle A of the ſquare. Through a point, as S, aſſumed on this ſide the line G L, draw a line, as X Z, parallel to the line G L. (Prob. 2). From the point S, draw a line as S O, perpendicular to the line G L. (Prob. 7). Alſo from the point S, draw the lines S G, and SL, ſeverally parallel to the ſides of the ſquare, A B, and A D, by making the angles G S X and L S Z reſpectively equal to the angles B A G and D A L. (Prob. 1.) And laſtly, draw the line S E biſecting the angle G S L. (Prob. 4). Which line will be parallel to the diagonal of the ſquare, AC.

In the courſe of drawing perſpective delineations of houſes, &c. continual mention and reference muſt be made to plans and their component parts, with which the ſtudent will be conſidered to be well acquainted; but leſt that ſhould not be the caſe, it is neceſſary he be inſtructed as to what is meant and expreſſed in a plan of a building, and informed how the ſame is read by architects and others, acquainted with their indications.

A plan of a houſe is commonly explained or defined, as being the figure, marked out on the ground of the external boundaries, and internal diviſions of the apartments of a building, either in actual exiſtence, or intended to be built. In one reſpect ſuch is a juſt definition, but in general, much more is expreſſed in plans than merely the ſituation, ſize, and figure, of the apartments; both to ſhew the proprietor what he is to expect, and that the builder may fully comprehend what he is about to erect. A plan, as moſt generally drawn, is properly an horizontal ſection of a building at a ſtated height; or it is the figure, which the top of the walls would exhibit, when raiſed all to the ſame level a few feet above the ground, if looked at from above directly down upon them; whereby many incidents in the ſtructure are expreſſed, that cannot be marked out in the trenches, or even take place, ſome four, five, or ſix, feet above ground.

[Plate 11.] This will be better underſtood by reference to ſenſible figures. To thoſe who are converſant in Architecture, the Elevation (Fig. 1, Plate 11,) would be nearly pictured in the imagination from the mere inſpection of the plan; Fig. 2; but the plan, Fig. 2, is not the figure that would be cut out in the ground, as ſhaping the foundation to the building; ſuch would be ſimply as Fig. 3, expreſſing little more than the length and breadth of the apartments, and thickneſs of the walls, more information could not be gathered from it. Whereas, from the plan, Fig. 2, is underſtood that in front there are two pillars ſtanding in a receſs, with a door between them, and a niche in the middle of the pier on each ſide; alſo, that in each end of the apartment, within, there is a window, that there is a chimney in the middle of the croſs-wall, with a door on the right leading into another apartment, and a receſs for a falſe door on the other ſide the chimney, to be uniform with the real door; that the lines 1, 2, 3, 4, 5, &c. expreſs an aſcending flight of ſtairs; that A is the half-landing, on which there is a window to light the ſtaircaſe, and that the dotted lines imply the returning flight to the next ſtory: all which is clearly gathered and immediately underſtood from inſpection of the plan ſimply, with other minute particulars; ſuch as the number of ſteps that conduct into the dwelling, implied by the lines marked a, b, c, that they fall within the pillars, that there is intended a plinth around the building expreſſed by the double line around, that there is meant a baſe to the pillars, and ſuch like minutia; and to the whole there is affixed a ſcale of feet, proportionally to the plan laid down, by means of which the dimenſions, that is, the lengths and breadths of apartments, may be known, and the breadths of doors, windows, fire-places, ſtairs, and treads of ſtairs, &c. may be accurately meaſured.

Such delineation is undoubtedly an horizontal ſection of the walls, taken ſome ſix or ſeven feet from the ground; ſomewhere about the height of the line B C, Fig. 1. Indeed there are particulars expreſſed that cannot be noticed till the building is raiſed conſiderably higher, as the window D, on the

Fig. 1.

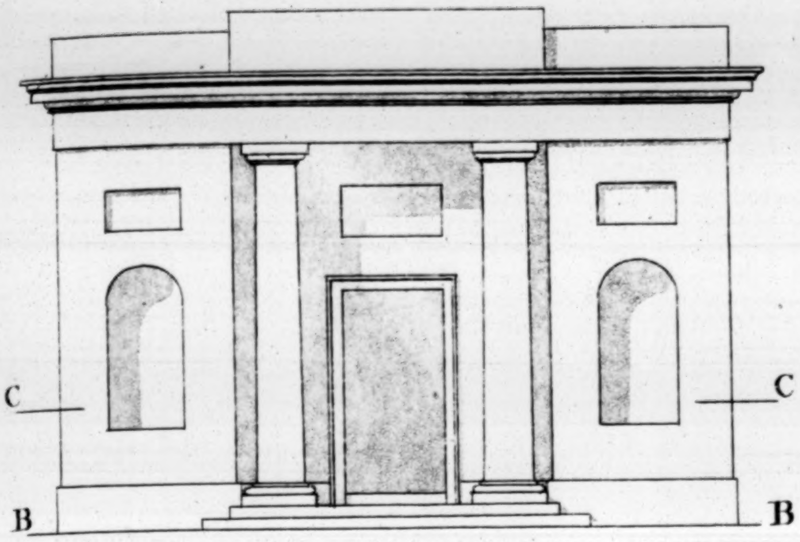


Fig. 2.

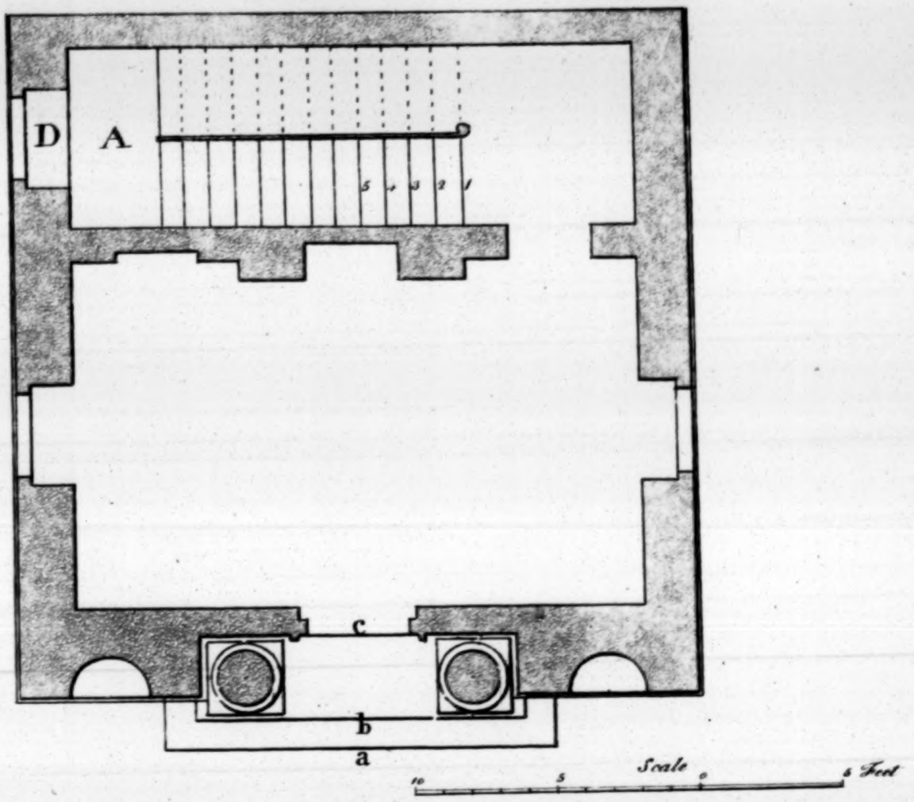


Fig. 3.

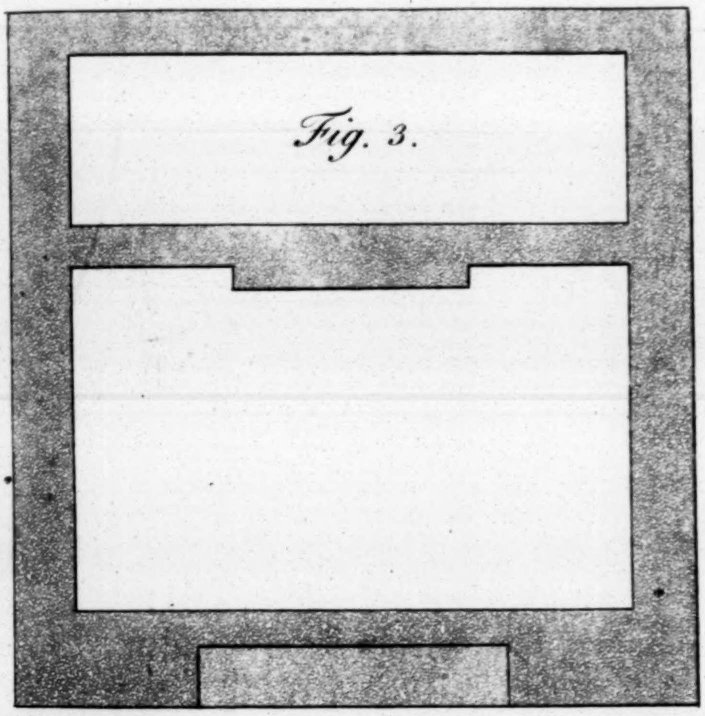


Fig. 4.

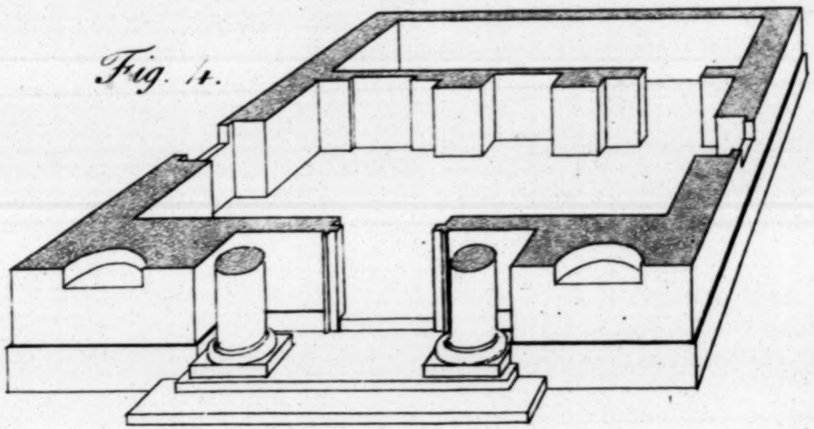


Fig. 5.

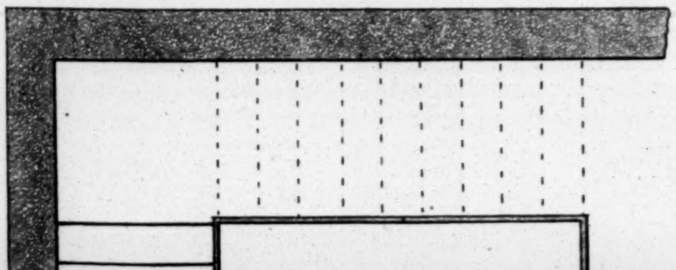
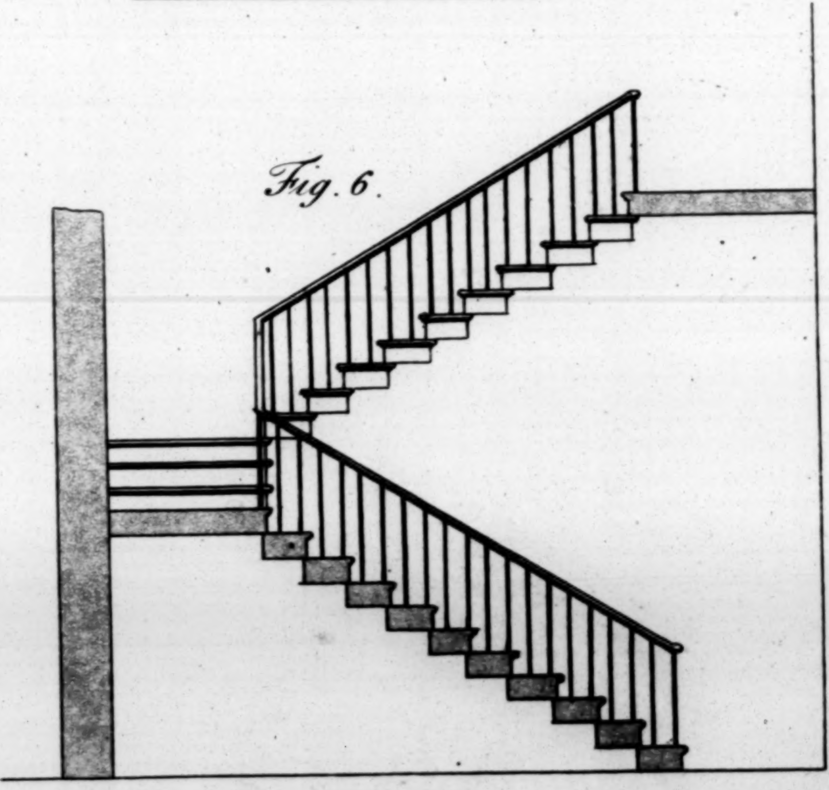


Fig. 6.



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half landing, and the completion of the ſtair-caſe to the ſecond ſtory. [Plate 11.] All of which may ſtill be better conceived from inſpection of the perſpective delineation, Fig. 4, repreſenting the ſtructure as raiſed ſome ſeven feet above the ground level, and of which the plan, Fig. 2, is the geometrical or ichnographical projection.

I have been thus particular to avoid all delay from the want of ſuch neceſſary information; and for the more certain aſſurance of having no impediment to check advances, I will deſcribe how a ſtair-caſe is read from its geometrical plan. Fig. 5, is the plan of a ſtair-caſe, ſhewing the ſpace of ground it occupies, and the number and breadth of the ſteps. Fig 6, is the geometrical elevation of that ſtaircaſe, ſhewing its relation to the plan, and the height and direction of the flight of ſteps to the ſtory above, to which they conduct: the height of the ſteps is regulated to the height they are intended to mount to, and the breadth, to the convenience of the tread and the ſpace allowed to contain the whole in.

PRACTICAL PERSPECTIVE.

IF the ſtudent has attentively peruſed the Introduction to this work, and fully comprehends it, he will be ably qualified to proceed to the practice of what is there inveſtigated; at the ſame time he will enjoy the ſatisfaction ariſing from knowing perfectly what he is about to do, and of being convinced of the truth of the reſult. Should he have neglected, or from previous knowledge have no occaſion for, that examination, he will here, merely have to perform as directed, placing implicit confidence in his inſtructor that he will not lead him aſtray.

The ſtudent is particularly requeſted, that he reſt not ſatisfied with only following me through my own diagrams and deſcriptions; it is requiſite that he draw them out himſelf, to a much larger ſcale; nor be content with performing each caſe once only, but to practiſe them twice, or thrice, varying their poſitions, and attentively following the general rules given for their proper delineation; by which procedure his knowledge will not only be ſtrengthened, but the practice will become eaſy and familiar. He ſhould alſo obſerve to proceed ſtep by ſtep, as directed, nor draw one line but as told; then will all confuſion vaniſh, miſunderſtanding be avoided, and the whole be clear and ſatisfactory.

Diſguſt is but too often conceived at the multiplicity of lines exhibited in works on perſpective delineations, reflection not being made, that every line of the whole example, and every needful proceſs requiſite for the completion of that example, are there obligated to remain, that the ſame may be ſeen and done by the ſtudent; but in his performance much the greater part need only be drawn in pencil, and obliterated when the end required is obtained; and this of every proceſs from firſt to laſt; thereby avoiding all neceſſity of confuſion of operative lines, they being removed like as the ſcaffolding is taken from about a building as it is completed.

As my entrance on this ſubject is different from any that has hitherto been made public, I deem it ſomewhat incumbent on me to give my reaſon for deviating from the beaten track; and it is briefly, that I think, before a ſtudent is capable of executing the minutiæ of this art, he ſhould firſt comprehend and practiſe it upon a general and broad baſis. I am therefore induced, in the firſt place, to give a number of examples for the delineation of the various ſimple forms of buildings, from the proper requiſites given or known. In the ſecond I ſhall exemplify the different parts of buildings, as doors, windows, ſteps, pedeſtals, baſes, and capitals of columns, cornices, vaſes, &c. And in the third, I ſhall combine the two former parts together, in the repreſentation of regular, and ſome difficult, pieces of Architecture; and conclude with the leading principles for caſting of ſhadows from a given place of the light. I purpoſe alſo, in an Addendum, to touch upon the ſubject of reflections on water, and plane mirrors, ſhowing their poſitive and only true attainment by the rules of perſpective; and a critical inquiry into ſome circumſtances of diſpute relative to diſtorted repreſentations of objects, ariſing from injudicious proceeding, but from no error or fallacy in the rules of perſpective delineation.

Before the practice is begun, I think it expedient once more to draw the attention to the principal definitions of terms uſed in the proceſs of perſpective delineations; and that they may be the more certainly underſtood, and more deeply impreſſed on the mind, I ſhall make reference from them to a ſcheme, which will, I am of opinion, with a little reflection, clearly ſhow their relation and unity, beyond almoſt a poſſibility of miſunderſtanding.

DEFINITIONS*.

[Plate 12.]

1. **Original Object, or Objects.** Is any object, or number of objects, propoſed to be delineated; as a houſe, a ſhip, a man, or all, or many of them, together.

In Figure 1, Plate 12, the houſe ABCDFHK, is the *original object.*

2. **Original Lines.** Are any lines that are the boundaries of original objects, or of planes in thoſe objects.

The lines AB, BC, CD, &c. are *original lines*, being the boundaries of the *original object* ABCDFHK.

3. **Ground Plane.** Is the plane upon which the objects to be drawn are placed; and is always conſidered a boundleſs level plane.

The plane X, is the *ground plane*, whereon ſtands the object ABCDFHK.

4. **Point of View, or Point of Sight.** Is the fixed place of the eye of the obſerver, viewing the object or objects to be delineated.

E, The eye of the obſerver, is the *point of view, or point of ſight.*

5. **Station Point.** Is a point on the *ground plane*, perpendicularly under the *point of ſight*, or eye of the obſerver, and expreſſes the ſtation whence the view is taken.

S, is the *ſtation point*, being a point on the *ground plane* perpendicularly under the eye of the obſerver, at E.

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* Theſe definitions refer alſo to my Apparatus.

[Plate 12.] 6. **Plane of Delineation, or The Picture.** Is the canvaſs or paper, upon which it is intended to draw any object or number of objects.

The plane GIKL, is the *plane of delineation*; but in the extenſive ſenſe of the word, the *plane of delineation* is conſidered a boundleſs plane, however circumſcribed may be the draft thereon made.

7. **Horizontal Line, or the Horizon.** In perſpective delineations, is a line on the *plane of delineation*, in every part level with the eye of the *obſerver*, or *point of view*.

VZ, Figure 1, is the *horizontal line*, on the *plane of delineation* GIKL.

The horizontal line is ſuppoſed obtained by the interſection of a plane paſſing through the eye of the obſerver, parallel to the *ground plane*, produced till it touches *the plane of delineation.*

The mere inſpection of the diagram, Figure 2, cannot fail of giving thorough inſight as to what is meant by the horizontal line, and how it is ſuppoſed obtained. FGHI is the *plane of delineation*, ABCD the *horizontal plane* paſſing through the eye of the obſerver touching the *plane of delineation* in the line BC, which is the *horizon*, or *horizontal line*.

8. **Centre of the Picture.** Is the point on the picture, perpendicularly oppoſite the eye of the obſerver or point of view; and is conſequently always ſomewhere in the *horizontal line*.

⊙, in the *horizontal line*, Figure 1, is the *Centre of the Picture*, being perpendicularly oppoſite the eye, at E.

9. **Vertical Line.** Is a line drawn through the *Centre of the Picture* perpendicular to the *horizon*.

PR, Figure 1, is the *vertical line*, being drawn perpendicularly through the *Centre of the Picture*, ⊙.

Note, the vertical line determines how much of the view lies to the right, and how much to the left, of the eye of the obſerver.

10. **Distance of the Picture.** Is the direct line between the eye of *the obſerver*, and the *centre of the picture*.

E ⊙, Figure 1, is the *diſtance of the picture*, or *plane of delineation* GIKL.

11. **Ground Line.** Is the line made by the *plane of delineation*, touching the *ground plane*.

GL, Figure 1, is the *ground line* of the *plane of delineation* GIKL.

12. **Intersecting Point.** Is a point made on the *plane of delineation*, by the producing of any line in an *original object*, till it touches *the plane of delineation.*

The point T, Figure 1, is the *interſecting point* of the *original line* B A. [Plate 12.]

13. INTERSECTING LINE. Is a line made on *the plane of delineation*, by the producing of any plane in an *original object*, till it touches the *plane of delineation*, or where, if produced, it would touch it.

The line WT, Figure 1, is *the interſecting line* of the *original plane* ABCDN; being the line, where that plane, if produced, would touch *the plane of delineation*.

14. VANISHING POINT. Is that point, on the plane of delineation, to which two or more lines will converge, which are the perſpective repreſentations of two or more parallel lines in an original object, placed inclined to the plane of delineation.

The point V, Figure 1, is the *vaniſhing point* of the line A B, being effected by the line E V being drawn from the eye of *the obſerver* parallel to it, and produced till it touches the *plane of delineation*, in the point V.

For the ſame reaſon, V is the vaniſhing point of the line C N; it is alſo the vaniſhing point for any other line that is parallel to the line C N, as BA; all parallel lines having the ſame *vaniſhing point*. The point Z, Figure 1, is the *vaniſhing point* of the line A K, being obtained by a line drawn from the eye parallel to the line A K, and produced till it touches the *plane of delineation*. The point Z is alſo the vaniſhing point of the original lines D F, and N H.

Note, There will be as many different vaniſhing points of lines in the delineation of an original object as there are different directions of lines in that original object.

The point I, Figure 1, is the vaniſhing point of the parallel original lines D N and F H; being effected by the line E I being drawn from the eye parallel to them till it touches the plane of delineation. And for the ſame reaſon Q is the vaniſhing point of the line C D.

In the proceſs of perſpective delineations, the plan of the object being drawn out, the place of the various vaniſhing points of horizontal lines is found on the ground line, whence they are transferred to the horizon by perpendicular lines over them; as may be ſeen, Figure 3. Where ſuppoſe S the ſtation of an obſerver, and E the point of view; the lines S A and S B may be the direction of lines finding the vaniſhing points of any original lines, and being transferred perpendicularly to the points C and D in the horizon, anſwer the ſame as if they had immediately been obtained from the eye by means of the lines E C and E D. The effects of the ſame proceſs may be obſerved in Figure 2, where the points F and I are transferred to the horizon perpendicularly, in the points B and C; the ſame as if they were effected on the horizontal plane by the lines EB and EC.

15. VANISHING LINE. Is a line on *the picture*, ſuppoſed made by a plane paſſing through the eye of *the obſerver* parallel to any *original plane*, and produced till it touches *the picture*.

The line VZ, Figure 1, is the *vaniſhing line* of an horizontal plane, and of all horizontal planes; being effected, by being the interſection of a plane paſſing

[Plate 12.] horizontally through the eye, or parallel to an horizontal plane. The vertical line IVG, is the *vaniſhing line* of the original vertical plane ABCDN, being the line where a plane paſſing the eye of *the obſerver* parallel to that plane, would touch the *plane of delineation*.

There will be as many different *vaniſhing lines* on the *plane of delineation* as there are different poſitions of planes in the object or objects; and all parallel planes will have the ſame *vaniſhing line*. Alſo all lines lying in the ſame plane will have their *vaniſhing points* in the *vaniſhing line* of that plane.

All planes or lines in an *original object*, which are ſituated parallel to the *plane of delineation*, can have no *vaniſhing lines* or *vaniſhing points* on the *plane of delineation*.

16. VISUAL RAY. Is an imaginary right line, implying a ray of viſion directed from the eye, to any point, the object of its regard or contemplation.

EA, or EI, &c. Fig. 1, are *viſual rays*, being right lines from the eye to the points A and I.

A number of viſual rays directed to every part of an object, muſt form a pyramid of rays, of which the eye is the apex, and the object the baſe.

17. A PERSPECTIVE DELINEATION. Is ſuch a delineation as may be ſuppoſed to be made by a plane making a ſection of a body or pyramid of rays proceeding from an eye, while contemplating an object, or many objects. Such a figure, or ſuch figures, obtained by the rules of perſpective, is called a perſpective delineation.

The ſection of a pyramid of rays, producing a perſpective projection, is moſt commonly conſidered as being taken between the object and the eye; but the ſection of rays may be taken when they are extended beyond the object, in which caſe ſuch a ſection is called a projected perſpective repreſentation of the object. The latter caſe gives ſuch a figure of the contour of the object, as would be made by the ſhadow of it from a torch being put in the place of the eye of the obſerver; as may be diſtinctly ſeen, Figure 4. Where G may be conſidered the place of the eye, or torch; HI the object; a b c d, the intervening plane; and KLMN the exterior plane beyond the object. The ſection of the rays h i, on the plane a b c d; is called the perſpective or ſcenographic projection; and the ſection m n, on the plane KLMN, the projected perſpective repreſentation, or ſhadow by torch light.

Fig : 1.

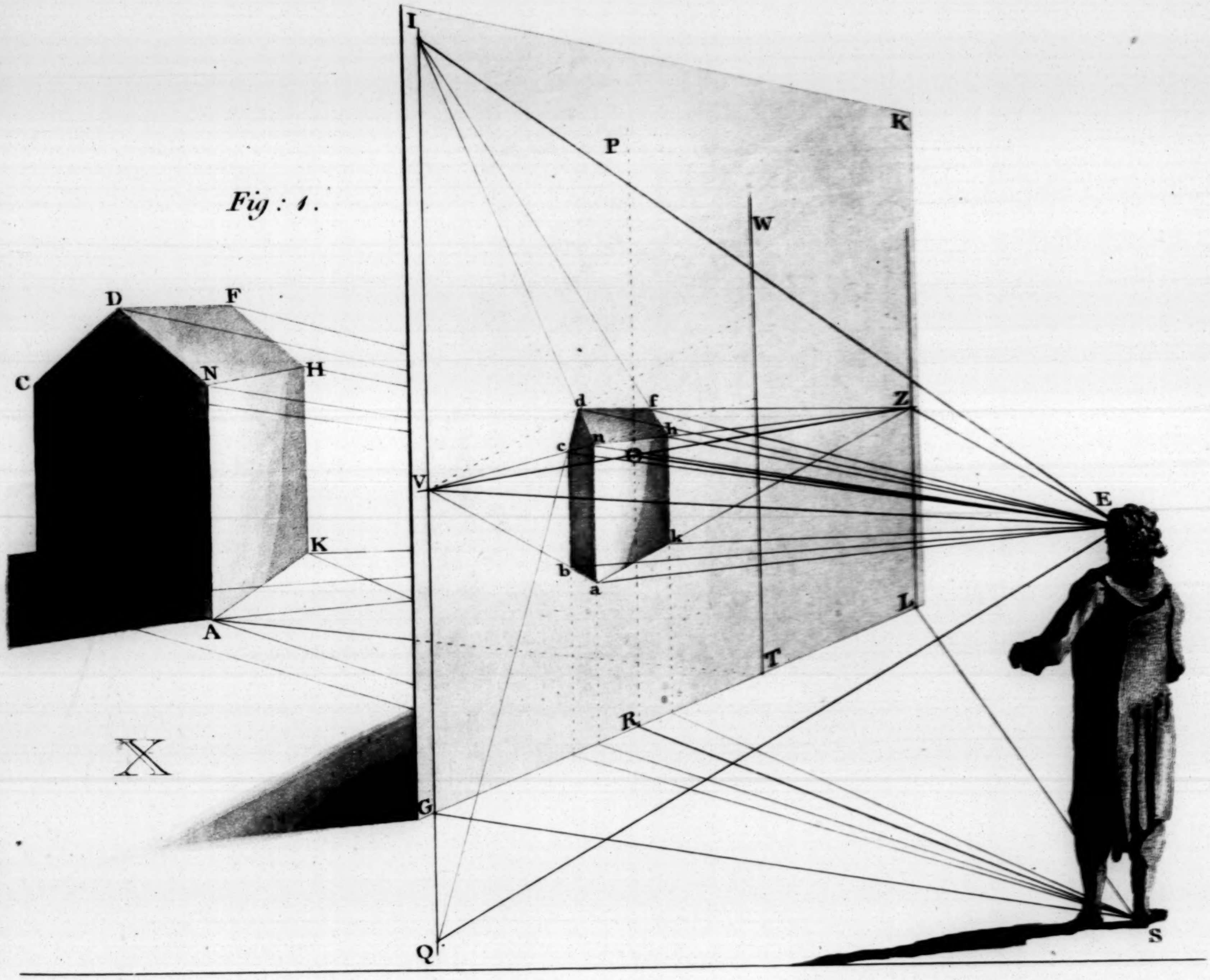

Fig : 2.

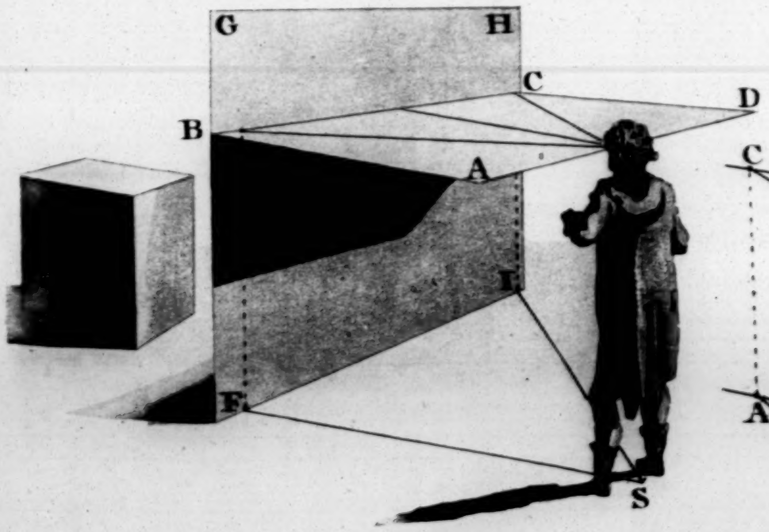

Fig : 3.

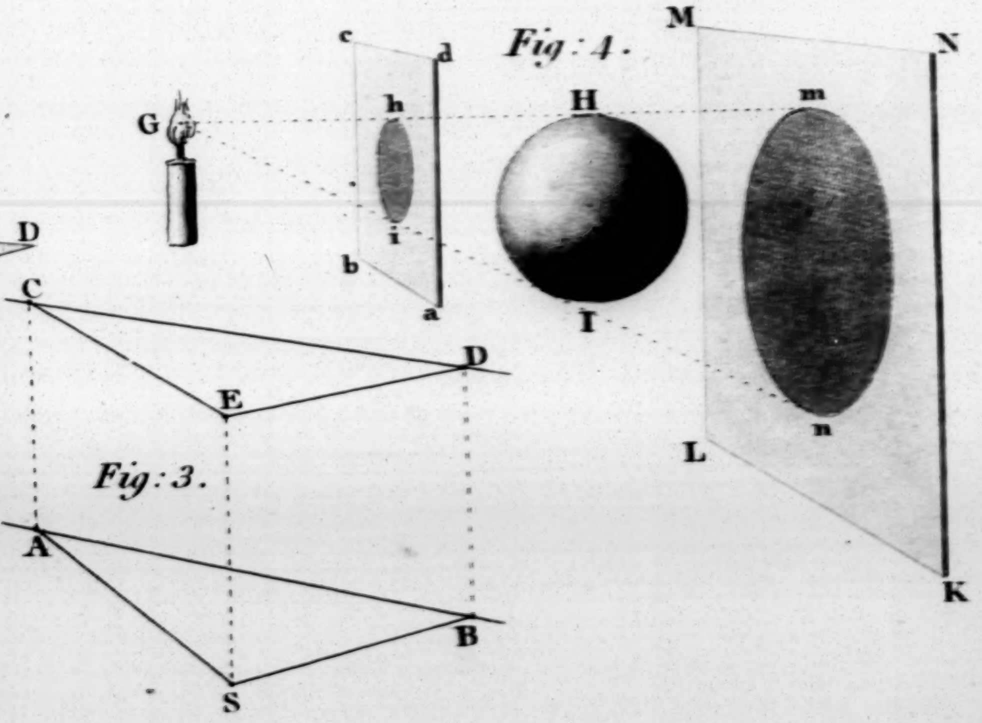

Fig : 4.

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To know perſpective, is to know the rules ſo to delineate objects, as to expreſs their apparent leſſening, as they are more and more remote. The apparent leſſening of objects, and their change of form, is the ſilent language of nature indicative of diſtance and variety of poſition. Perſpective, according to the elegant and correct definition of Addiſon, is, " the ſcience by which things are ranged in picture, according to their appearance in their real ſituation."

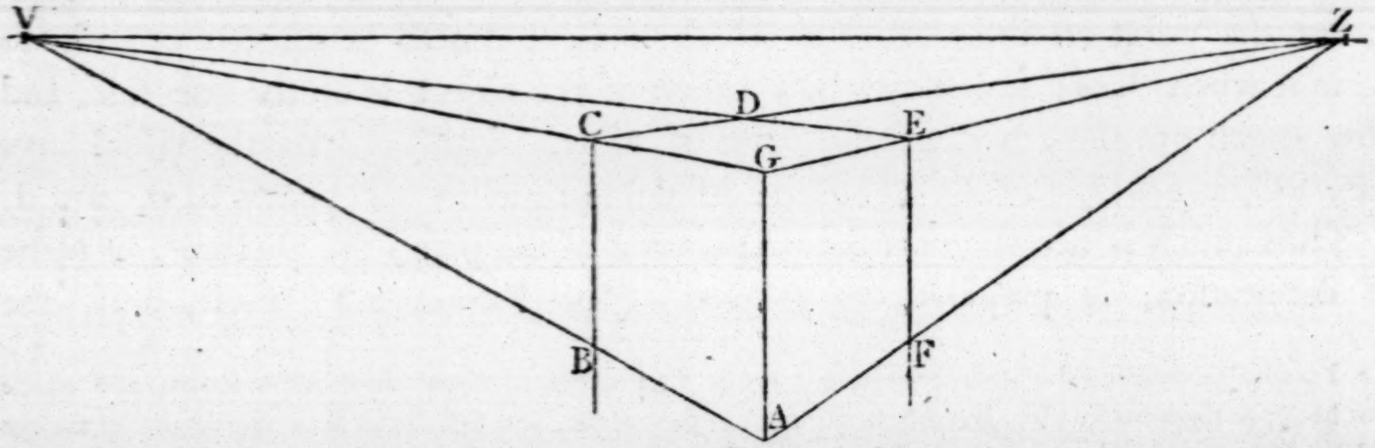
The ſituation of the objects being given, with the place and poſition of the plane of delineation, and height and diſtance of the eye of the obſerver; the delineation of the objects is truly determinable by rule, and may moſt mechanically be performed, as follows:

EXAMPLE I.

[Plate 13.]

Let it be required to find the apparent form that a cube would exhibit, if when placed over the ſquare ABCD (*Fig.* 1, *Plate* 13), *its baſe, it was viewed by an eye elevated two inches perpendicularly over the ſtation* S, *and ſuppoſing the plane of delineation to ſtand vertically over the line* GL.

Firſt, I would adviſe the Student to place a cube before him in the poſition ſtated, and recommend that a ſketch of its appearance be made by the eye alone, as correctly as he can, which will for certain be a form agreeable to the figure below. In ſketching, particularly of regular objects, judgment ſhould ever direct the hand; as here, the eye being elevated ſomewhat above the cube, the top of it will, of conſequence, be ſeen, and, in the poſition ſtated, will appear nearly of the form of the delineation GCDE, and whatever may be the height of the near angle of the cube in the drawing, as AG, the more remote angle, CB, being to repreſent an equal height ſeen at a greater diſtance, ſhould be made ſomewhat leſs than AB. In which caſe the horizontal lines of the top and bottom, GC and AB, will be inclined to each other, and would, if produced, meet; and being horizontal lines, or the repreſentations of horizontal lines, would meet ſomewhere in the horizontal line. Suppoſe the line VZ the place of the horizon, V would be the point of their union or tendency,



called their *vaniſhing point*. For the ſame reaſon the angular line EF, ſhould alſo be made leſs than the angle AB; and the point of tendency of the horizontal lines GE and AF, would alſo be in the horizon, at the point Z. The figure required, therefore, will nearly reſemble the figure here drawn, the figure ABCDEF[a].

[Plate 13.] Clearly to underſtand what we are about to do, is the firſt and ſureſt ſtep to compaſs the end deſired. We are now going to obtain, by mechanical proceſs, the figure that the contour of a cube would make ſtanding over the ſquare ABCD, to the eye of an obſerver raiſed two inches above the point S; the point S, and the baſe of the cube, ſtanding on the ſame level plane.

Knowing the figure of its appearance from the ſketch, we will now obtain its *preciſe* form, according to principle, with ruler and compaſſes[b]. Draw the neceſſary operative lines (Fig. 14, Plate 10); Through the ſtation S, Fig. 1, draw the line XY, parallel to the direction of the plane of delineation, GL; then the lines SG and SL, reſpectively parallel to the lines AB and AD of the baſe of the object, which lines, produced to the plane of delineation, determine the *vaniſhing points* of the horizontal lines AB and AD, and of all horizontal lines parallel to them. Draw the line S⊙, perpendicular to GL; which line being the perpendicular direction of the eye to the plane of delineation, determines the point on the picture to which the eye ſhould be directly oppoſite to view it when done; and ſhows how much of the object is on the one ſide, and how much on the other, of the point of view. Laſtly, draw the viſual rays SB, SC, and SD, cutting the plane of delineation in the points b, c, and d.

Thus much is neceſſary for the preparation of the plan; the picture[c], or plane of delineation, is prepared, as follows. (See Figure 2.) Firſt, draw the

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[a] I would recommend the Student to have three or four cubes, of about three inches ſquare, and adviſe that he apply them before him agreeably to the caſes as they occur, and firſt ſketch their appearance by the eye and hand alone, and after, perform the ſame by rule.

[b] The Student ſhould here put paper on his drawing-board, and ſet the very examples himſelf as they occur, and to a larger ſcale. In the preſent inſtance, he ſhould place the ſquare of the baſe of the object ABCD; then draw the line of the plane of delineation GL, fix his ſtation, S, and proceed with his drawing exactly as directed in the proceſs. Among many good advantages that will attend the ſo doing, will be one, not the leaſt, that of his not having a confuſion of lines at one time; for, drawing them only as directed, every thing will be clear and devoid of confuſion. It is otherwiſe with all the diagrams in the work; the preſent, for inſtance, includes four diſtinct Examples that will be ſeparately treated on, and has all the neceſſary lines drawn that relate to them, exhibited at once to view.

[c] The picture ſhould be made on a paper ſeparate from the plan, though here they are done all on one, to ſhow their connexion the more clearly, and for want of room.

[Plate 13.]

ground line G L, and, parallel to it, and two inches above it[a], as ſtated, the horizontal line, V Z. Mark on the horizon the point ⊙, to which the eye is ſuppoſed to be perpendicularly oppoſite, to view the picture when done. Every other preparation is taken from the plan, and may be done in the order following. Set off the diſtances of the vaniſhing points ⊙ G and ⊙ L, Figure 1, on the horizon, Figure 2, at ⊙ V and ⊙ Z; alſo the ſeveral diſtances ⊙ b, ⊙ c, ⊙ A and ⊙ d, Figure 1, at ⊙b, ⊙ c, ⊙ A, and ⊙ d, on the ground line of the picture, Figure 2, through which points draw fine perpendicular lines, indefinite, which lines I will call viſual lines, and thus proceed.

As the near angle of the object, A, touches the plane of delineation, it is clear that that angular line, in the repreſentation, will be the ſame height as the object; that is, equal to the length A B or A D in the plan, Figure 1. Take therefore the length from A to B in the compaſſes, and apply it on the perpendicular line A B, Figure 2, and draw the lines B V and B Z; alſo A V and A Z, which cutting the other viſual lines in the points e, f, and h, i, determines the two perpendicular ſides of the cube A e f B and A B h i. Then draw the lines h V and f Z, interſecting each other in the point g, in the perpendicular line g c; which will complete the whole linear repreſentation of the cube A e f g h i. If the delineation A e f g h i were placed upright over the line G L (Figure 1), the line G L of the one, placed exactly on the line G L of the other, and the points b, c, A and d of the one, over the points b, c, A and d of the other, a ſolid cube put on the ſquare A B C D would exactly fit the figure A e f g h i, were it cut out, and viewed by an eye elevated two inches over the ſtation point S[b].

EXAMPLE II.

[Plate 13.]

Let it be required to find the form that another cube would exhibit, when placed by the ſide of the firſt, and viewed from the ſame ſtation and point of view.

The ſquare B E F C, Fig. 1, is the baſe of the ſecond cube, and being poſited in the ſame direction, and parallel to the firſt, the ſame preparatory lines will ſerve; there only remains to draw the viſual rays E S and F S cutting the ground line G L in the points x and w.

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[a] In this diagram it is two inches, but in that made by the Student it may be to three or four times the ſcale, that is, ſix or eight inches, or any height at pleaſure.

[b] The Student, provided with cubes, is adviſed to try this little experiment, when he has completed his drawing, and he will find it perfectly ſatisfactory.

[Plate 13.] The ſame preparatory lines on the picture (Figure 2) will alſo ſerve in this caſe. V Z will be the horizon, and Y, and Z, will be the vaniſhing points of the horizontal lines. Take the diſtances ⊙ w and ⊙ x, Figure 1, in the compaſſes, and apply them at ⊙ w and ⊙ x, Figure 2, and draw the perpendicular viſual lines p w and n x, indefinitely.

The two cubes being in contact with each other, the angle over B is common to them both; and becauſe in the ſame direction, the lines B V and A V, Figure 2, being drawn, determine the ſide e k m f; which ſide being obtained, draw then the lines m Z and g V, interſecting at n, and the figure of the ſecond cube is determined, and is the figure e k m n g o. The ſide e f g o, being in contact with the firſt cube, cannot be ſeen unleſs the bodies were tranſparent.

EXAMPLE III.

It is required to find the figure that a cube would exhibit, if, placed over the ſquare BEFC, *Figure* 1, *it was viewed by an eye two inches above the ſtation* S, *the plane of the picture ſtanding perpendicularly over the line* G L.

Note, The Student is deſired to pay particular attention to this propoſition, and view it as a new example under the ſtated premiſes.

Draw the lines S G and S L parallel to the ſides of the object B E and BC, in order to obtain their vaniſhing points, G and L. Draw the viſual rays E S, B S, F S, and C S, cutting the ground line G L in the points x, b, w, and c; and produce the line of the object, E B, till it interſects the ground line in the point A. Laſtly, draw the line S ⊙ perpendicular to the line G L.

Prepare the picture, Figure 2, by drawing the ground line G L, and parallel to it, and two inches above it, the horizontal line V Z. Fix the point ⊙ in the horizon, the point oppoſite the point of ſight[a]; and alſo the point ⊙ in the ground line, directly under it. Set off the diſtances of the vaniſhing points G and L, Figure 1, at V and Z, Figure 2; alſo the ſeveral diſtances ⊙ x, ⊙b, ⊙ w, and ⊙ c, Figure 1, at ⊙ x, ⊙ b, ⊙ w, and ⊙ c, Figure 2, and draw fine perpendicular lines, in pencil, through them.

Becauſe the near angle of the object is at a diſtance from the picture, it will not be repreſented on the picture, its full height; that is, equal to the real height of the object; that is done only when the object touches the plane of delineation;

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[a] That point, on the picture, is often called the CENTRE OF THE PICTURE, meaning thereby that the point of ſight ſhould be directly oppoſite it, at its proper diſtance; and for the future, for the ſake of brevity, it ſhall be ſo called, throughout the work. See Definition 8.

as it did in the firſt example at the angle A. Its reduced height therefore, [Plate 13.] agreeable to its diſtance from the picture, muſt be obtained; and which is very readily done as follows:

If the plane of the object, in the direction of the line E B, Figure 1, were continued forward, it would touch the plane of the picture in a perpendicular line over the point A, and would there mark its height. Let that be done, by producing the line E B to A; then ſet off the diſtance ⊙ A, Fig. 1, at ⊙ A, Fig. 2, and draw the line A B, Fig. 2, indefinite. The line A B is the interſecting line of the plane of the object in the direction of the line B E, Fig. 1 (Def. 13).

Proceed on the picture in the following manner; on the interſecting line A B, make A B equal the height of the object, and draw the lines B V, and A V, which, croſſing the viſual lines b f and x m, determine the plane e k m f, for the repreſentation of the plane of the object over the line E B, Fig. 1, from which part the whole figure is ſoon obtained. By drawing the lines f Z and e Z, the plane e f g o is determined, and drawing the lines m Z and g V, the top of the cube, f m n g, is found, and the whole figure, e k m n g o, is completed, which is in the linear repreſentation of the object. Reflection will immediately point out, that the figure but juſt now obtained, muſt be the ſame with the one found by the ſecond example, which was done by means of the angle e f, of the firſt cube; 'tis only ſuppoſing the firſt taken away, and the ſecond left by itſelf.

When neither ſide of the object touches the plane of the picture, it is immaterial, as to the performing of the operation, which ſide is produced for an interſecting line; choice only ſhould be made of that which will leaſt interfere with the work. In the example, juſt performed, the ſide E B was produced for an interſection, as at A, but the ſide B C might as well have been produced[a]; let it be ſo done, as at K, Fig. 1, and mark off the diſtance ⊙ K, at ⊙ K, Fig. 2, where make the height K M equal the height of the object, that is, equal to the height A B, and draw the lines M Z, and K Z, which will fall in with the before-found lines f g and e o, and form the plane e f g o; from which the whole figure could readily be completed, as may be obſerved from inſpection.

EXAMPLE IV.

It is required to give the repreſentation of a cube as being placed directly upon the one found by the former example, that is, upon the cube ſtanding on the ſquare B E F C, *under the premiſes ſtated, with the laſt example.*

The ſame preparatory lines in plan and picture, with the laſt, will ſerve in

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[a] The Student is deſired to draw the whole figure by means of that interſection, that he may be convinced of the truth of either proceſs, and of the coincidence of both.

[Plate 13.] this example. In Fig. 2, lengthen the viſual lines k m, e f, and o g, to p, q. and r; then proceed as follows:

Set up the height of the cube on the interſecting line A B H, Fig. 2, above the height of the firſt, that is, make B H equal B A, and draw the lines H V, and q Z cutting the viſual lines in the points q, p, and r, giving the figure f m p q r g for the contour of the required cube; which riſing above the horizon, the top is not ſeen, and the horizontal lines p q, and q r, decline to their vaniſhing points V and Z.

The Student is adviſed to place three cubes, agreeably to the diſpoſition of the three cubes forming the group, Figure 2; and, having ſo placed them, to draw their appearance by the hand and eye, as nearly as poſſible from the ſame point of view; afterwards to draw them as one example correctly by rule.

The linear repreſentations only, of the cubes have been deſcribed, but the aſſiſtance of ſhade has been given, that their forms might be the better diſcerned; and the Student is adviſed to colour each of his operations, as they are performed. A double advantage will thereby be obtained, that of embodying his linear figures, and gaining a freedom of ſhadowing and tinting at the ſame time.

If it ſhould be ſuggeſted, of what advantage can the drawing of cubes placed in ſuch or ſuch poſitions be? I can only anſwer, that, from the ſimplicity of their forms, they are given as firſt examples; but though ſimple, they may nevertheleſs compriſe the forms of irregular and pictureſque figures, as well as regular and formal ones, of which Figure 3 may ſerve as an inſtance, and is given to intimate that a ſubject of difficulty may be derived from a ſubject of much apparent ſimplicity.

There can be but two ways of placing a cube, in a vertical poſition, to the plane of delineation, and thoſe are, either with both ſides inclined to it, as has already been four times done, or with one ſide parallel to it, and the other, of conſequence, perpendicular to it. Inclined poſitions have been given; we will now proceed to delineate a parallel one.

[Plate 14.]

EXAMPLE V.

It is required to find the appearance that a cube would make, on the plane of delineation, when placed with one ſide parallel to that plane.

Let the ſquare A B C D, Figure 1, Plate 14, be the ſituation of the cube; the line G L, the poſition of the plane of delineation, parallel to the face of the cube over the line A B; and let S be the ſtation of the obſerver.

If the face B A of the cube, touched the plane of delineation, it is clear, a ſquare, equal to the ſquare A B C D, Figure 1, would be the repreſentation of

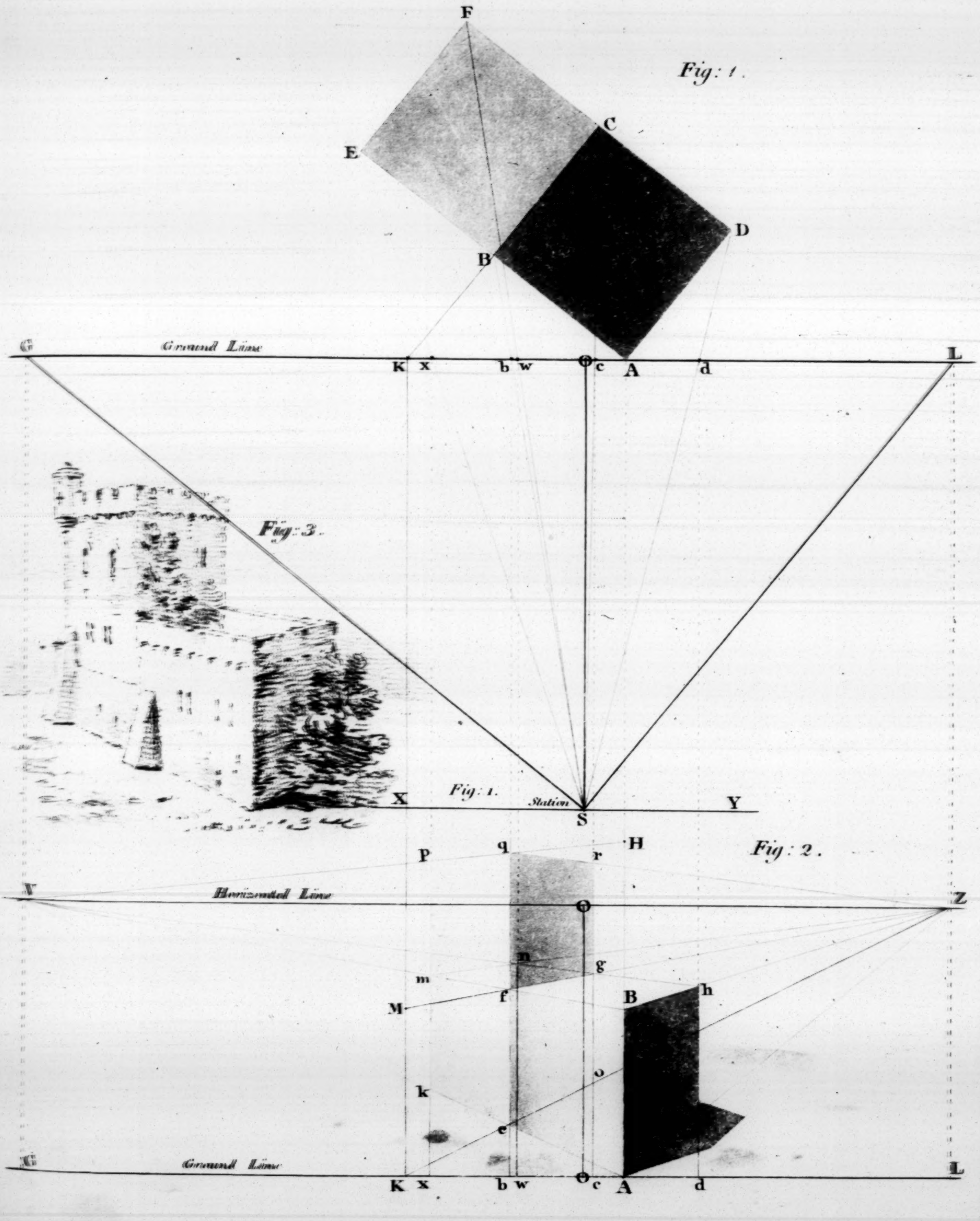

Fig: 1.

Fig: 3.

Fig: 2.

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[Plate 14.]

that ſquare; but it is at a little diſtance from it; conſequently, though it will be a ſquare, as being a parallel ſection of the pyramid of viſion, it will be a ſomewhat ſmaller ſquare than the face of the cube, and ſmaller in juſt proportion to its diſtance from the picture. To aſcertain which, it is neceſſary to have an interſection of ſome plane of the object with the picture, as of A D in the point I. Draw the line S ⊙ perpendicular to the ground line G L, ⊙ will be the vaniſhing point of the line A D and of all lines parallel to it; alſo draw the viſual rays A S, B S, C S, and D S, cutting the ground line, in the points b, c, a, and d.

Prepare the picture (Figure 2), as follows: Draw the ground line G L, and parallel to it, and at any height at pleaſure, the line Y Z, for the horizontal line. Mark the point ⊙, the centre of the picture, on the horizon, and alſo the point ⊙ perpendicularly under it, on the ground line. Set off the ſeveral diſtances of the viſual interſections, ⊙ b, ⊙ c, ⊙ I, ⊙ a, and ⊙ d, Fig. 1, at ⊙ b, ⊙ c, ⊙ I, ⊙ a, and ⊙ d, Fig. 2, and draw fine pencil lines perpendicularly through them, upwards on the picture.

The line drawn through the point I, is the interſecting line, on which mark the height of the cube, as I K, equal to a ſide of the cube in the plan, as A B, Fig. 1, and draw the lines K ⊙ and I ⊙, Fig. 2, cutting the viſual lines a n, and d i, in the points n, i, and e, k, forming the plane e n i k, as the repreſentative face of the cube, over the line A D in the Plan. Parallel to the horizon draw the lines n g and e f, determining the ſquare e f g n, as the repreſentative ſquare over the line B A in the plan, Fig. 1. Laſtly, draw the lines g ⊙ and i h, interſecting in the point h, forming the figure n g h i, as the top of the cube, and giving the figure e f g h i k, as the linear repreſentation of the whole cube, under the premiſes ſtated.

EXAMPLE VI.

Figure 3 repreſents the plan of three rectangular ſolids, placed ſide by ſide, forming the general figure E F H K.

It is required to find their repreſentation, ſuppoſing them to ſtand with both faces inclined to the plane of delineation, which is given in the place and direction of the line G L, *and* S *is the ſtation of the obſerver.*

Draw the preparatory lines; firſt the line W X, parallel to the ground line G L, then the line S ⊙ perpendicular to it; alſo the viſual rays F S, P S, N S, E S, M S, and K S, cutting the ground line in the points e, f, g, h, i and k; and produce the face of the object F E, to B, for an interſection. Laſtly, draw the

[Plate 14.] lines SV, and SR, reſpectively parallel to the two faces of the object EF and EK, to obtain their vaniſhing points.

It will be obſerved, that there is not extent enough of paper for the line of the picture, GL, and the line SR, to come in contact; in ſuch caſe an expedient muſt be uſed. Take any portion of the diſtance of the picture S⊙, ſuppoſe half, as at m, and draw the line mL parallel to SR; then will the diſtance ⊙L be half the diſtance of the required vaniſhing point. Should the line at half the diſtance not come within the limits of the paper, then let a third or a fourth of the diſtance be taken; the parallel line being drawn, will give a proportional diſtance of the vaniſhing point.

Let the line BC, Fig. 4, be the direction of the plane of the picture, let A be the ſtation point, AC will be the diſtance of the picture. Let AB be the direction of a line finding a vaniſhing point at B. Divide the diſtance of the picture into two equal parts at D, and draw the line DE parallel to AB; then will the diſtance CE be *half* the diſtance CB. Take a third part of the diſtance AC, at F, and draw FG parallel to AB; then will GC be a *third* part of the diſtance BC. Thus whatever portion is taken of the one, drawing the parallel line will give a like portion of the other, for the triangles formed are ſimilar, and the correſponding ſides will therefore be proportional.

Prepare the picture[a] Fig. 5; that is, draw the horizontal line YZ, and the ground line GL, parallel to each other, at any diſtance at pleaſure. Fix on the point , in the horizon, for the centre of the picture, and draw the vertical line ⊙⊙. Set off the diſtance of the interſecting point B, Fig. 3, and of the viſual points ⊙e, ⊙f, ⊙g, ⊙h, ⊙i, and ⊙k, at A, and ⊙e, ⊙f, ⊙g, ⊙h, ⊙i and ⊙k, Fig. 5, and draw the viſual lines through them. Laſtly, ſet off the diſtance of the vaniſhing point V, Fig. 3, at P, Fig. 5, and the diſtance of the vaniſhing point Z, Fig. 5, at twice the diſtance ⊙L, Fig. 3[b]; and proceed in the following manner:

On the interſecting line AC[c], Fig. 5, ſet up the height of the object, which ſuppoſe AB, and draw the lines AP and BP, cutting the perpendicular viſual

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[a] Preparation of the picture, always implies, firſt, determining the diſtance of the horizontal and ground lines (Def. 7 and 11). Secondly, the fixing on the centre of the picture (Def. 8), and drawing the vertical line (Def. 9). Thirdly, the ſetting off the diſtances of the vaniſhing points (Def. 14), and ſetting off the diſtances of the interſections of the viſual rays, with the ground line, in the plan, on the ground line of the picture; and this is deſired to be underſtood and done in future, on the being told to prepare the picture.

[b] It is abſolutely neceſſary, without having recourſe to a very troubleſome proceſs, which ſhall be given in the courſe of the work, to have the places of the vaniſhing points, on the picture, that the relative lines may be drawn in true direction to them. When the paper, or drawing-board, is not long enough to receive them on it, a piece muſt be added, as here, or a lath muſt be fixed to the board; where, placing a pin in the vaniſhing points, a ruler may be laid to them, and the work may be done with as much accuracy, as were they not above a foot diſtance.

[c] The Student will obſerve, that when by reference one courſe of the alphabet has been exhauſted, I have been of neceſſity reduced to begin another; by which the ſame letter will be ſometimes twice or thrice repeated in the ſame plate; but by being uſed in parts remote from each other, it is hoped all confuſion will be avoided. I think ſuch proceeding better, than having recourſe to Italic, or Greek letters, as ſome authors have done; by which, the Student, not acquainted with Greek characters, is quite at a loſs what to call them.

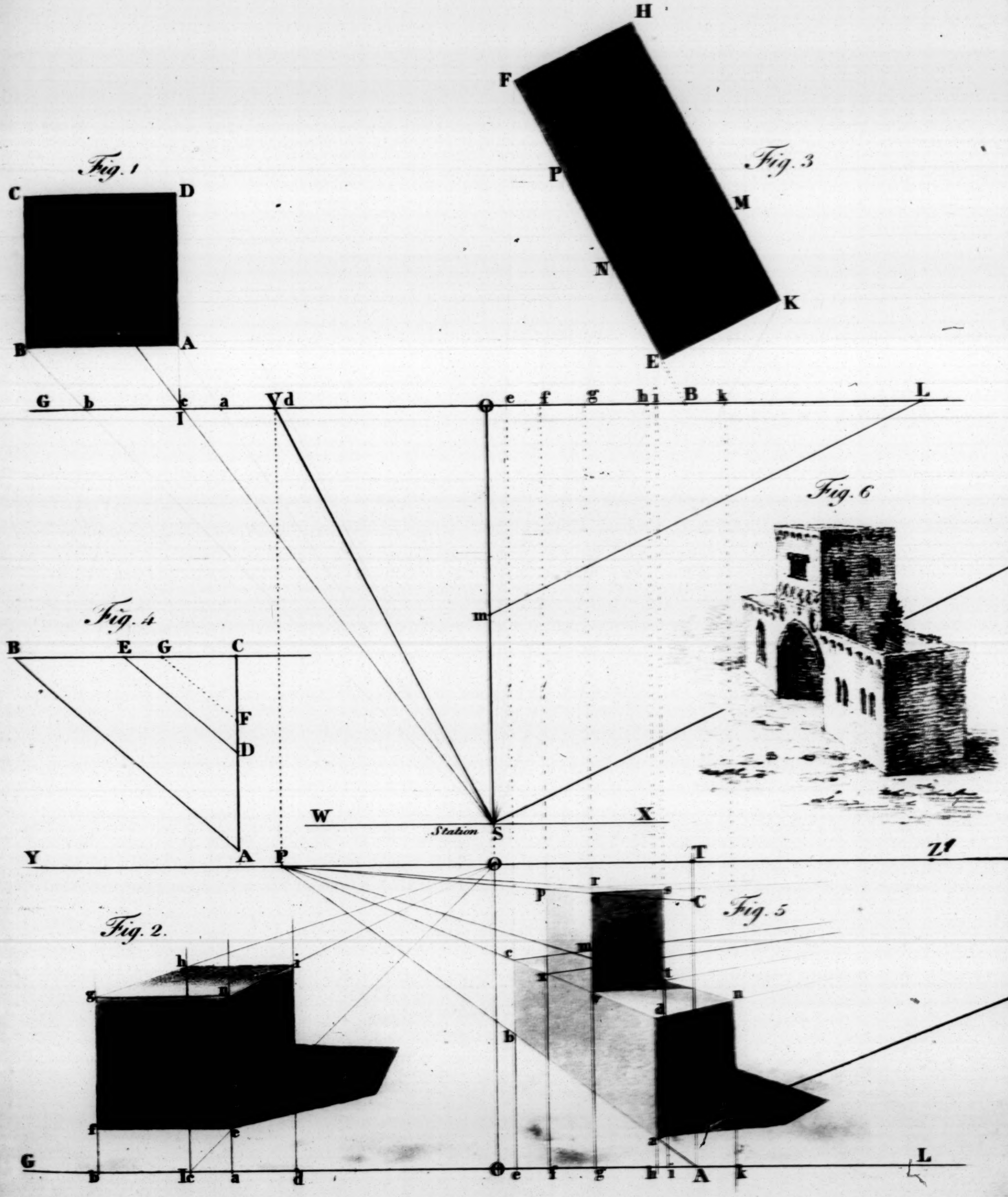

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

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lines, and determining the figure a b c d, for the repreſentation of the face of the [Plate 14.] object over the line E F, Fig. 3; then draw the lines d Z and a Z, which will obtain the plane of the end of the object a d n o; and laſtly draw the lines c Z and n P, interſecting at m, and completing the figure a b c m n o; the figure required. By drawing the lines x Z and v Z, the whole figure is divided into three parts, agreeable to the three rectangles in the plan, Fig. 3.

EXAMPLE VII.

It is required to find an equal and like figure to one of the foregoing, as if placed on the ſecond of the three figures of the laſt example.

As this example introduces no new poſition of plane in the original object, the ſame preparatory lines will anſwer, as in the former example; and as all the viſual lines are already drawn, it is neceſſary only to heighten them.

On the interſecting line A C, Fig. 5, ſet up the height B C equal B A, and draw the line C P; determining the plane v x p q for the front of the required repreſentation; after, draw the lines p r and q s to their vaniſhing point, Z, giving the plane v q s t, as the other ſide of the object; to which the top is added by drawing the line s P, ſhaping the figure q p r s, for the top; and completing the form v x p r s t, the repreſentation required.

The top of the object q p r s, Fig. 5, being very near the horizon, is, of conſequence, very little ſeen; had the object been higher, ſtill leſs would have been viſible; had it fallen in with the horizon, that is, had B T and not B C been the height of the object, none of the top could have been ſeen, but its repreſentation would have been a line in the direction of the horizon.

Fig. 6 is meant to ſhow what the compound of the two laſt ſimple examples might involve; and is introduced to encourage the Student in his purſuit, by giving a foretaſte of the reſult of his labours, and to inſtance that while he is applying rules and principles upon, ſeemingly, very unintereſting objects, the ſame extend to and embrace irregular and pictureſque ones.

Hitherto the examples have united as few different directions of planes, forming a ſolid figure, as could well be given; they may be ſuppoſed to have been buildings with flat or no roofs; it is now my intention to introduce other directions of planes, as inclined roofs; and theſe in ſome variety.

Roofs are of various kinds, but two only are neceſſary to be obſerved upon here, and theſe are what are called gable-end roofs, and hipped roofs. A gable-end roof, is when the end walls of the building go perpendicularly up to the point of the ridge, and the ridge extends from end to end of the building.

[Plate 15.] The upper part of the end walls are therefore of a triangular form, to the depth the roof ſlants down. ABCDE, Fig. 1, Plate 15, repreſents the end wall of a gable-end roof; CDE being the triangular part formed by the roof. A roof is ſaid to be hipped when the ridge comes ſhort of the extent of the building and ſlants down on every ſide; AEFGH, Fig. 2, may convey the idea of a hipped roof; and both one and the other be further explained by Fig. 3, where the line IK indicates the ridge of a gable-end roof, and OP the ridge of a hipped one; and OM and PN the ſlant at the ends. A roof may have one end gable and the other hipped, and is often ſo conſtructed.

EXAMPLE VIII.

It is required the repreſentation of a quadrangular building ſituated with each ſide inclined to the picture, covered with an A[a] *roof, each end being a gable-end.*

Let the rectangle ABCD, Fig. 4, be the plan of the building; the line EF will be the place of the ridge of the roof, extending from end to end. Let the line QL be the place of the plane of delineation, and let S be the ſtation point.

Find ⊙, the centre of the picture; alſo the points Q and L, the vaniſhing points of the lines AB and AD and their parallels. Produce the face of the building AD to I for an interſection with the picture; and draw the viſual rays interſecting the ground line of the picture in the points b, e, a, f, and d[b].

Prepare the picture, Fig. 5, by drawing the horizontal and ground lines VZ, and GR, at any diſtance from each other at pleaſure; fix upon the centre of the picture ⊙; and draw the vertical line ⊙⊙; ſet off the diſtances of the vaniſhing points ⊙V and ⊙Z, equal the diſtances of the vaniſhing points ⊙Q and ⊙L in Fig. 4; draw the interſecting line IL, Fig. 5; and all the viſual lines through the points b, e, a, f and d, taken from their reſpective places and diſtances b, e, a, f, and d, Fig. 4; and proceed as follows:

On the interſecting line IL, Fig. 5, ſet up the height IK, equal the height of the building BC or HG, Fig. 1 and 2; and draw the lines KZ and IZ, determining the plane gmop, for the front of the building. Draw the lines

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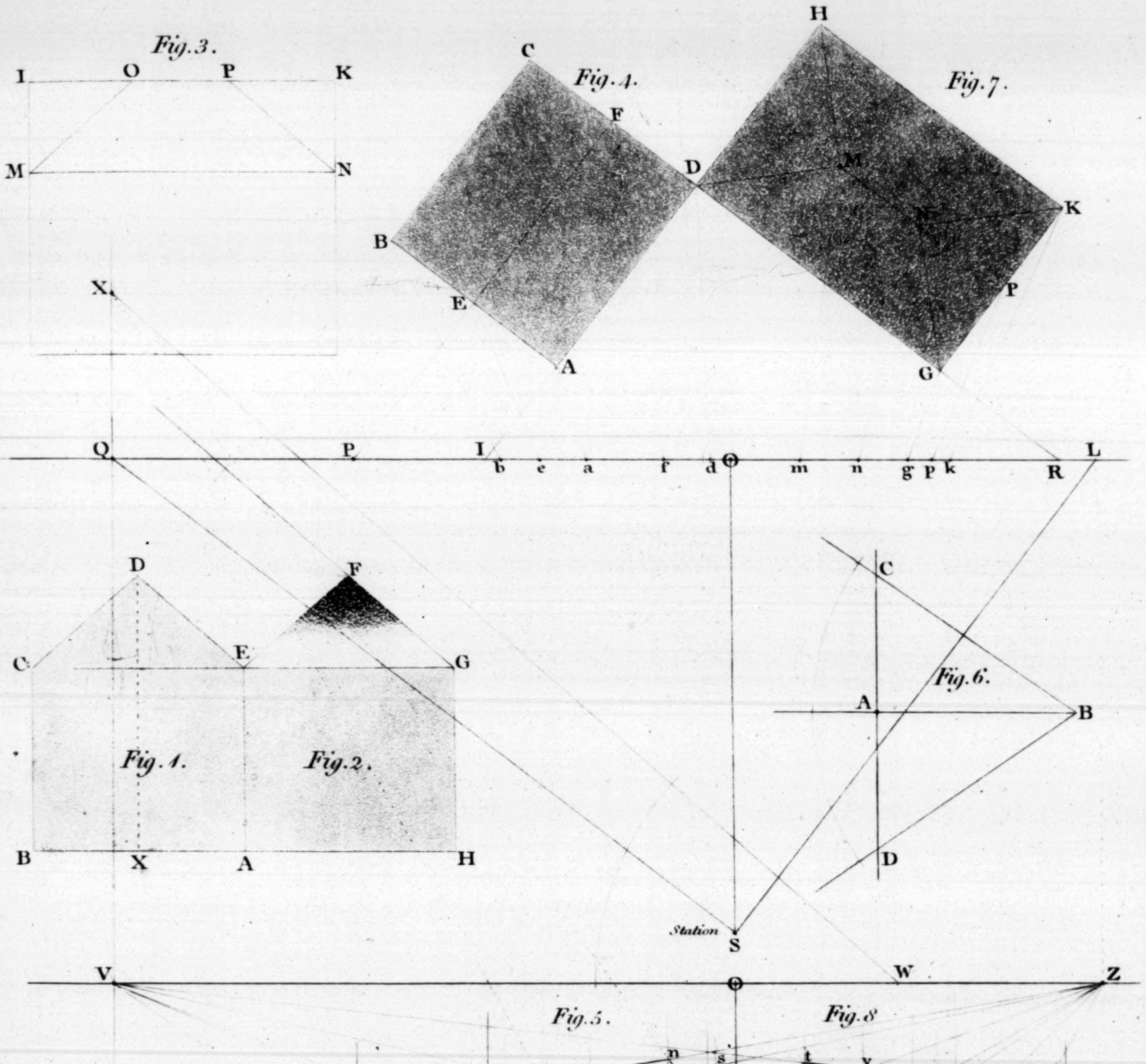
[a] A ſingle pitched roof is conſtructed in the form of the Roman capital letter A, and is therefore, by builders, called an A roof. A double pitched roof is, for the ſame reaſon, called an M roof, as it nearly reſembles that letter; but is more like the letter W, inverted, thus M.

[b] It is not neceſſary to draw the viſual rays beyond their interſection with the ground line of the picture: it is ſufficient they be drawn to there, in the direction to the ſtation point; for the future, therefore, they will be drawn no farther, and the ſtation being fixed, and expreſſed on any part of the plate, it will be ſufficient the viſual rays be drawn to the picture in direction to that point.



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m V and g V, determining the end of the building g h i m. It now remains to [Plate 15.] place the roof, which is readily done, but which however requires ſome circumſpection in the proceſs.

Place the height of the roof X D, Fig. 1, on the interſecting line at I L, Fig. 5, and draw L Z, which will give the height of the roof on the angular line of the building g m, at r; from which ſpot it may readily be transferred to its proper place in the viſual line e k, by the line r V, which cuts the line e k in the point k, the point required. From the point k draw the lines k i, and k m, completing the gable-end of the building. Draw the ridge of the roof k Z cutting the end viſual line, in the point n; and laſtly, draw the line n o, completing the whole linear delineation of the building g h i k n o p.

It muſt be carefully obſerved, that whatever original plane is produced to the picture to obtain an interſection, that that interſection ſerves only to obtain heights in the direction of that plane; whence they may be transferred to other planes in contact with it; as in the preſent inſtance. The interſecting line I L, Fig. 5, is the interſecting line of the plane g m o p; of conſequence, any original height ſet up on that line can only be transferred throughout the direction of that plane; for inſtance, the height of the roof K L was transferred by the line L Z, all along that plane to its other extremity s, but the line r s is not the place of the ridge of the roof, which lies in the middle of the plane g h i k m, proceeding from the point k; but any height on the angular line g r, is eaſily transferred along that plane by means of its horizontal vaniſhing point V: by which means the height of the roof was obtained by the line r V, at k. If, inſtead of the plane over the line A D, Fig. 4, being produced for an interſection, the plane of the middle of the houſe in the direction of the ridge of the roof, had been drawn, and the height of the roof had been ſet up on that line, it would, at one application, be transferred to its proper place.

Let the line F E, Fig. 4, be produced to P for an interſection; ſet off the diſtance ⊙ P, at ⊙ P, Fig. 5, and draw the interſecting line P R. On P R, ſet up the height of the ridge of the roof, equal the height X D, Fig. 1, and draw the ridge line R Z, which line will determine the exact ridge of the roof between the proper viſual lines, and will be found to correſpond, exactly, with the ridge before obtained, by the former proceſs.

The roof may be found by a very different proceſs[a]. I do not ſhow it for its beauty alone, though that is great, or for its utility either, but to manifeſt the truth of the rules of Perſpective, by experience of their juſt coincidence.

The ſlant lines of the roof will have their vaniſhing points on the picture, as well as any other direction of lines in the ſame object. The line k m, Fig. 5, being in the vertical plane g h i k m, will have its vaniſhing point ſomewhere in the vaniſhing line of that plane (Def. 15). A vertical line drawn through the horizontal vaniſhing point V, will be the vaniſhing line of the plane g h i k m;

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[a] If the Student poſſeſs not a conſiderable degree of diſcernment, and quick penetration, it will require ſome ſerious inveſtigation ere this proceſs be fully comprehended, which, in truth, it is almoſt impoſſible to make perfectly clear without proper apparatus, and perſonal explanation.

[Plate 15.] of conſequence, the vaniſhing points of the lines k m, k i, and all lines parallel to them, will be ſomewhere in the vertical line G V Q X.

Two lines drawn from the eye, parallel to any two lines in an object, finding their vaniſhing points, will make the ſame angle at the eye, as the lines in the object make with each other; for the two lines in the one inſtance are reſpectively parallel to the two lines in the other.

The line S Q, is drawn from the ſtation S, parallel to the line A B, Fig. 4, and a line drawn from the ſtation S, making the ſame angle with S Q, as E D does with E C, Fig. 1, will find the vaniſhing point of the line E D, and which point muſt evidently be ſomewhere in a vertical line through the point Q. To obtain which point in practice, take the diſtance of the vaniſhing line it is in, that is, the length from S to Q, in the compaſſes, and ſet off the ſame on the horizon, Fig. 5, from V to W. At the point W make an angle, V W X, equal to the inclination of the roof, that is, equal to the angle C E D, Fig. 1, and produce the line till it interſects the vertical line through the vaniſhing point V, in the horizon, in the point X. The point X will be the vaniſhing point of the line of the roof k m, Fig. 5; and of the line n o, parallel to it. The ſlant lines of the roof k m and n o, already obtained, will, on application of a ruler, be found to tend to the point X, agreeably to the above ſtatement.

By the ſame reaſoning the line of the roof k i, Fig. 5, will alſo have its vaniſhing point, and in the ſame vertical line G V Q. It will be found to be as much below the horizontal vaniſhing point V, as the point X is above it. See the plate explaining the definitions, under the article Vaniſhing Point; Def. 14.

Let the line A B, Fig. 6, be the line of the horizon; let the line C D be the vaniſhing line of a vertical plane, being the gable-end of a houſe; and let the angle A B C be the angle of inclination, finding the vaniſhing point of the ſlant lines of a roof in one direction. Let the line B D be the line, finding the vaniſhing point of the ſlant lines in the other direction, having the ſame inclination to an horizontal line: then will the angle A B D be equal the angle A B C, and the diſtance A D equal the diſtance A C.

EXAMPLE IX.

It is required to find the repreſentation of a quadrangular building, ſituated inclined to the picture, covered with a ſingle hipped roof.

Let the quadrangle G D H K, Fig. 7, be the plan of the building, the line M N will repreſent the ridge of the roof. The former line Q L may be the place of the plane of delineation, and it may be viewed from the ſame ſtation S. [Plate 15.]

The poſition and direction of the lines of this object being the ſame as thoſe of the former example, the preparatory lines that ſerved the preceding, will anſwer for this. It is requiſite only to draw the viſual rays MS, NS, GS, PS, and KS, interſecting the picture in the points m, n, g, p, and k; and to produce the line DG, for an interſecting point, at R.

Prepare the picture, Fig. 8. Let the line VZ be the horizon; GR the ground line; ⊙ the centre of the picture; and the points m, n, g, p, and k, the correſponding points with m, n, g, p, and k, Fig. 7. Draw the viſual lines through thoſe points, and the interſecting point R, and proceed as follows:

On the interſecting line RE ſet up the height RT, equal the height of the object HG, Fig. 2, and draw the lines TV and RV, cutting the viſual lines of the front of the building in the points z and o, y and p, determining the plane ypoz, for the repreſentation of the plane of the front: from the angular points z and y, draw the lines zw and yx, to their vaniſhing point Z, determining the plane yzwx for the end of the building.

On the interſecting line, ſet up the height of the roof TE, equal the height NK, Fig. 3, and draw EV cutting the angular viſual line of the building in the point e; from which point draw the line eZ, cutting the viſual line pa, in the point a, the point of direction of the ridge of the roof; draw the line aV, which, cutting the viſual lines through the points m and n, in the points t and v, determines the exact portion of the ridge of the roof, tv, which is the repreſentation of OP, Fig. 3, or of the ridge MN, Fig. 7: draw the lines to, vz, and vw, which will complete the whole repreſentation required[a].

In Fig. 8. If the lines az and aw be drawn, they will form a gable-end yzawx, of which the point a is the point of the gable, and will anſwer for the direction of the ridge, whether it be a gable-end, or a hipped roof; for in both caſes it lies in the middle of the breadth of the houſe; wherefore the line aV anſwers as well the ridge of a hipped roof, as of a gable-end.

On examination of the plans of the two buildings, Figures 4 and 7, it will be obſerved, that they are placed at right angles with each other, and in contact at the point D; which being the caſe, the ſecond example could have been eaſily accompliſhed from the firſt, without need of another interſection, or other preparatory lines, than merely the additional viſual rays from the viſible

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* The Student is particularly adviſed to be ſure he *perfectly* underſtands the proceſs of theſe two examples ere he proceeds farther; as all that will follow, will, more or leſs, have relation to them. He is recommended to practiſe them on a large ſcale, that he may the better ſee the affinity and relation the lines and planes have to one another; and to be very careful in the proceſs.

angles of the ſtructure; but the exemplification of this proceſs ſhall be made part of the ſubject of the next example.

[Plate 16.]

EXAMPLE X.

Let the form ABCDEF, Fig. 1, Plate 16, be the general plan of a building, of which, let the ſquare FGCH be the plan of a tower, and the other two parts ABGF and EFHD be ſubordinate parts, with gable-end roofs, and reſting againſt the ſides of the tower. Fig. 2, is a geometrical elevation of the building; IKLM the height and breadth of the tower; ON the height of the roof of the lower building, and OP the height of the upright walls.

It is required to find the repreſentation of the above building, as it ſtands poſited to the plane of delineation at the line RT, *from the ſtation* S.

Find the vaniſhing points R, and T, by lines from the ſtation drawn parallel to the different faces of the building; alſo the centre of the picture ⊙; produce the line FE to X, for an interſection; and draw all the neceſſary viſual rays. Prepare the picture, Fig. 3. Let VZ be the horizon; ⊙ the centre of the picture; V and Z the vaniſhing points of the horizontal lines; GL the ground line, and ⊙ ⊙ the vertical line. Set off the diſtances of the points b, a, g, f, n, h, e, d, and X, Fig. 1, at b, a, g, f, n, h, e, d, and X, Fig. 3, and draw fine up-lines through them indefinitely; then proceed as follows:

On the interſecting line XT, Fig. 3, ſet up the height XY, equal the height of the walls of the building OP, Fig. 2. Alſo the height YW, equal the height of the roof PN, Fig. 2; and draw the lines Xi, Yk, and Wv, to the ſame vaniſhing point, V; determining the plane of the building uikm, and the height of the roof on the angular line, at v. From the points v, m, and u, draw the lines vZ, mZ, and uZ, obtaining the height of the roof, at o, in its viſual line; and by drawing the lines om and op, the whole gable-end umopq is completed. Draw the ridge of the roof oz, cutting the end viſual line n, in the point z, and draw the line zk; then is the whole building over the plan EFHD, Fig. 1, completed; from which the other parts may readily be projected. Draw the lines ks, and ir, by direction to their vaniſhing point, Z; alſo the lines sy, and rt, by tendency to their vaniſhing point, V. In the plan Fig. 1, produce the ridges of the two roofs till they meet, at the point K; from which point draw the viſual ray Kl, agreeable to which interſection, draw a viſual line at l on the picture, Fig. 3; to which line produce the ridge of the roof oz, touching it at c; from c draw the line cw, tending to the vaniſhing point Z, cutting the viſual lines of the ridge of that building in the points w and x; wx

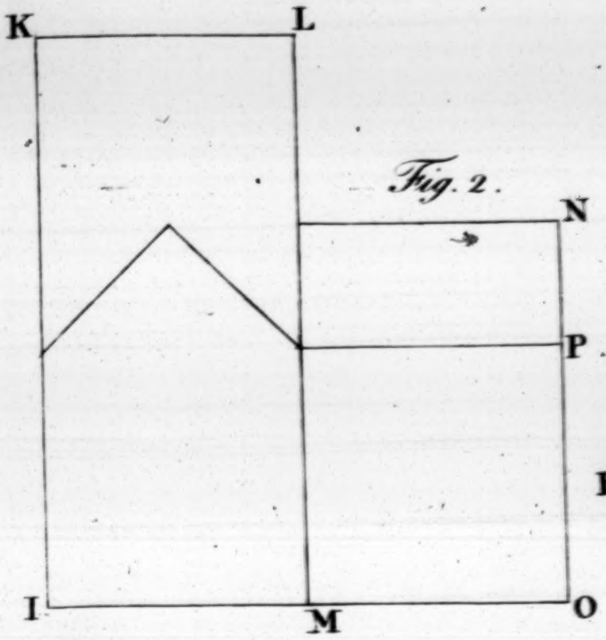

Fig. 2.

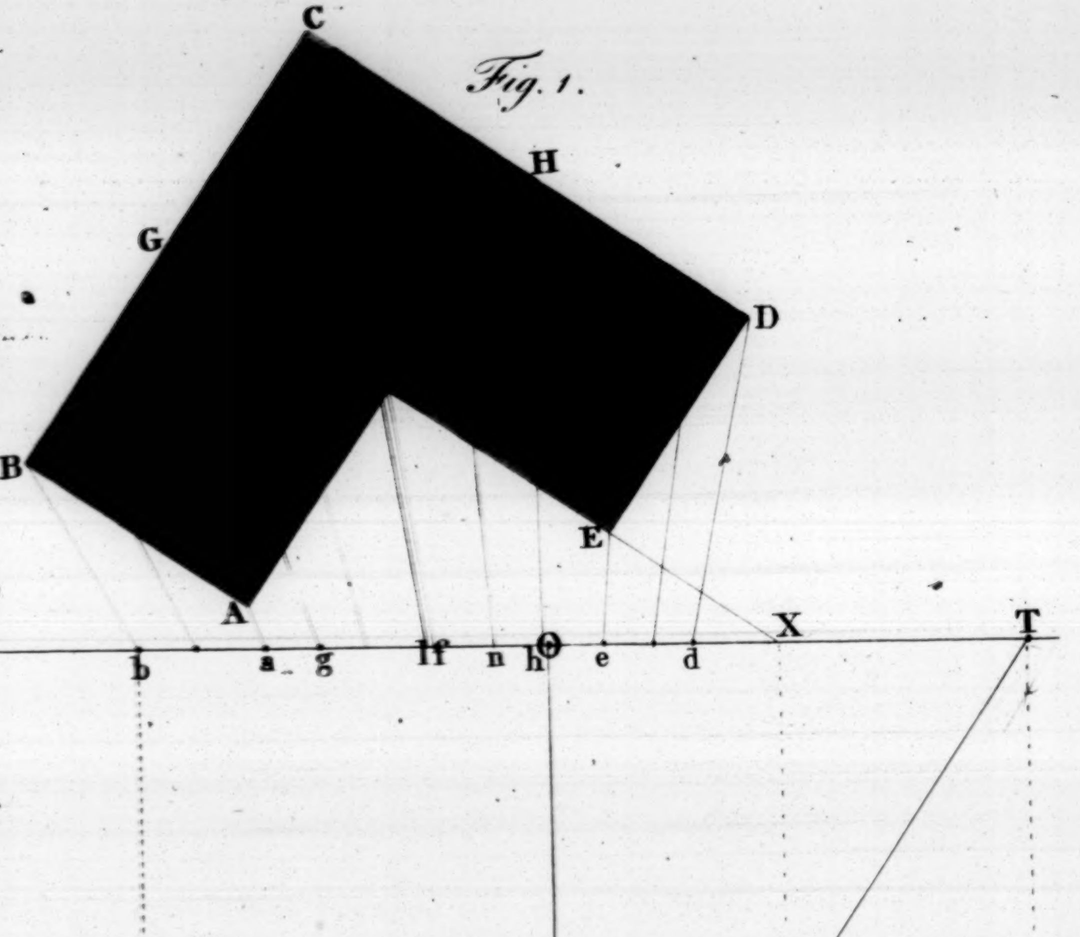

Fig. 1.

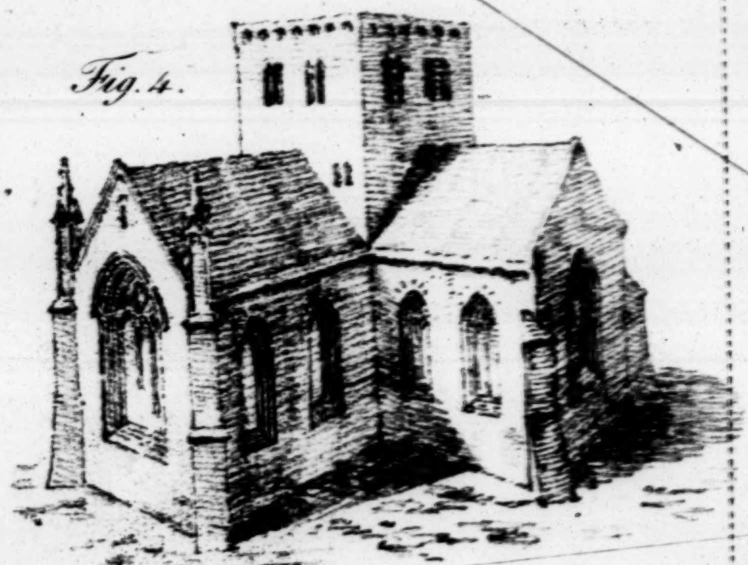

Fig. 4.

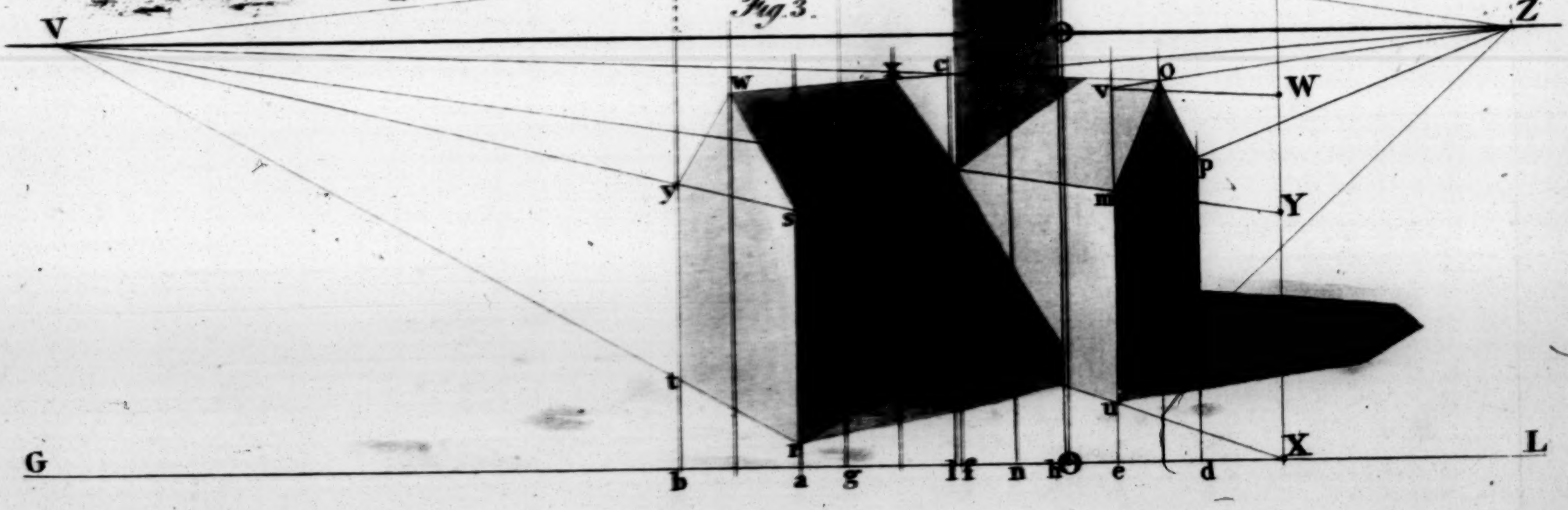

Fig. 3.

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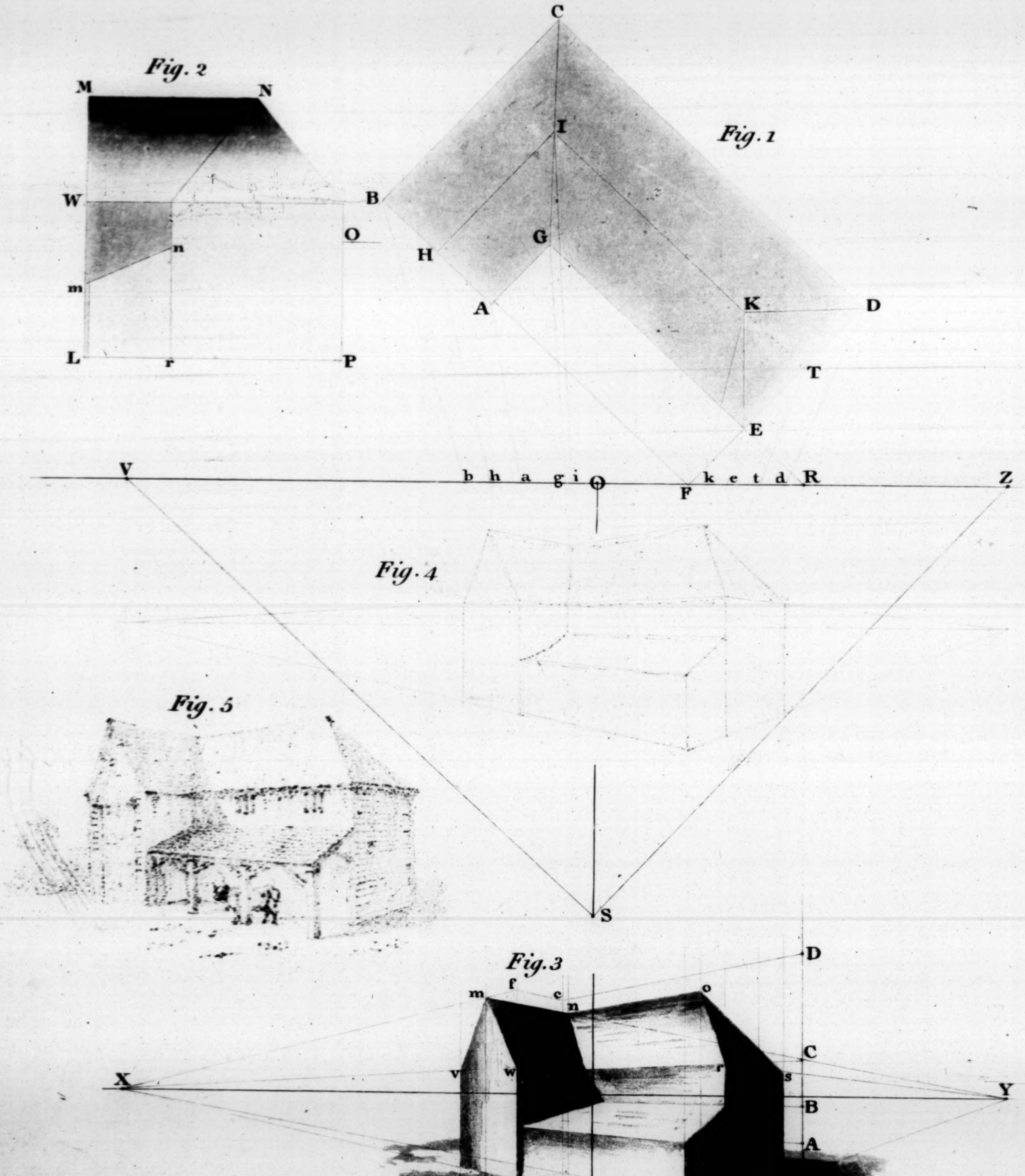

Fig. 2

Fig. 1

Fig. 4

Fig. 5

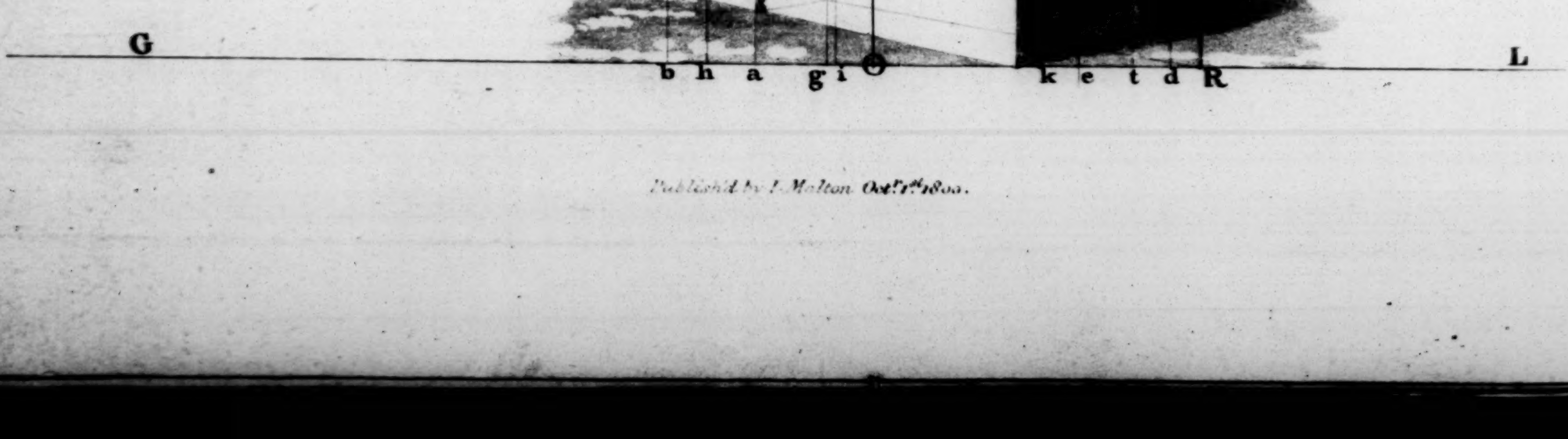

Fig. 3

Publish'd by J. Malton Oct.r 1st 1800.

[Plate 16.]

is the ridge of the roof. Draw the lines wy, w s, and x k, completing the other building, over the plan A B G F, Fig. 1. The delineattion of the tower is ſoon accompliſhed: on the interſecting line X T, make the height X T, equal the height of the tower M L, Fig. 2, and draw the line T V, cutting the viſual lines of that face of the tower, in the points *a* and *b*; from the angular point *a*, draw *a* Z, cutting the other viſual line of the tower in the point *e*, which will complete the whole of the required repreſentation.

Fig. 4 is introduced to ſhow to what a complicated object, ſuch a figure, as is juſt now obtained, may apply. I will give one more example on the true delineation of roofs, and then proceed to other objects.

EXAMPLE XI.

[Plate 17.]

Let the figure F A B C D (Fig. 1, Pl. 17) be the plan of a building, the ridge of whoſe roof let be the line H I K; forming a gable-end at the face A B, and a hip at the end E D. Let Fig. 2 be the geometrical elevation of the ſaid building, expreſſing the ſeveral heights; and let P O be the height of the horizon.

It is required to find the figure ſuch building would preſent, ſtanding in the poſition and place it does, to the plane of delineation over the line V Z, *from the ſtation* S; *the point of ſight being equal the height from* P *to* O, *Fig.* 2.

Obtain the centre of the picture $\odot$, as alſo the vaniſhing points of the different directions of horizontal lines in the building V, and Z; draw all the viſual rays from the viſible angles of the building, cutting the ground line in the points b, h, a, g, i, k, e, t, d; and produce the face G E to R, for an interſection.

Prepare the picture, by drawing the horizontal and ground lines X Y and G L, parallel to each other and diſtant equal the height P O (Fig. 2); fix the diſtances of the vaniſhing points, and place the centre of the picture, on the horizontal line Fig. 3 at X, Y, and $\odot$; alſo ſet off the diſtances of the viſual interſections at Fig. 1, at the correſponding diſtances, Fig. 3, and draw the viſual lines perpendicularly through them.

On the interſecting line, R D, ſet up the ſeveral heights of the building R A, R B, R C, and R D, equal the geometrical heights L m, r n, L W, and L M, of the elevation, Fig. 2, and proceed with the delineation, as follows. The height R C, on the interſecting line, Fig. 3, is the height of the upright walls; deſcribe it around the building, by means of the vaniſhing points, to the ſeveral viſual lines, in the points r, x, w, v, and s; and deſcribe the bottom line of the building, to the ſame viſual lines by means of the point R. The height of the roof, from the point D, may alſo readily be transferred to its proper place, as follows; Firſt, to the extreme viſual line in that direction of the wall of the

[Plate 17.] building, in the point c; whence convey it to the angular viſual line through the point a, at f, by means of the vaniſhing point Y; and thence to its proper viſual line through the point h, at m, determining the point of the gable-end, which the lines m v, and m w, complete. From the point of the gable, m, draw the ridge, m n, to its vaniſhing point Y; and the return of the ridge, n o, to its vaniſhing point, X: draw the hip lines o r, and o s; and the line n x, and the whole roof will be completed.

The ſhed, or lean-to, is obtained from its heights A and B; as may clearly and ſatisfactorily be ſeen, from examination of the figure.

The truth of delineation, that is, drawing agreeably to the ſtricteſt perſpective, is unqueſtionably as requiſite to be attended to in deſcribing old and decayed objects, as in tracing the moſt perfect. Without due attention to truth in the delineation of the former, they may be moſt prepoſterouſly repreſented. It is not becauſe being inclined, being really out of perpendicular, that they may be made to incline any how; they muſt be made ſo with judgment.

It is an adviſable method to delineate a rude object, of any importance, truly, as if quite perfect, and then deſtroy it at pleaſure, tempering the ſtroke of ruin with the hand of judgment. For inſtance, in the ſubject but juſt truly delineated (Fig. 3), and ſhown in a pictureſque manner (Fig. 5); let it firſt be delineated ſtrictly correct, in pencil, with every angle and boundary made perfectly ſharp and regular, as is expreſſed by the ſharp lines, Fig. 4; then, with the deſtroying hand of time, trace the rougher figure there drawn around it. The rude figure is not leſs under the governance of perſpective than the perfect one, but only leſs indicative of abſolute departure from truth. A tree is delineated perſpectively when delineated properly. "Delineate a tree agreeably to rule," I was told by a gentleman[a] to whom I made the obſervation, and who well underſtood perſpective, and much admired it. "I will, my Lord," I replied, "if you will draw its geometrical plan and elevations."

It is a very pleaſurable proceſs, the breaking down a regularly drawn ſubject into ruin; and it is done with the more ſatisfaction when it is performed with confidence, ſenſible at the ſame time it is not random work, but that it is true delineation governed by rule and judgment.

Thus far advanced, having gained conſiderable information on right-angled, or ſquare objects, it is now expedient to turn attention to round ones, and from them make reference to many-angled ones, as hexagons and octagons.

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[a] The late Lord Mountjoy, ſo lamentably killed, during the Rebellion in Ireland in 1798, at the battle of Roſs.

I know not for what reaſon writers on perſpective commonly divide the ſubject of linear delineation into two parts, which they term rectilinear and curvilinear; there ſeems to be an evident impropriety in this diviſion of the ſubject, ſince the ſame proceſs, ſimply, is followed in both caſes in determining of known forms, whether bounded by right lines or curves. It is generally obſerved on entering on the inveſtigation of curvilinear delineation, that the perſpective repreſentation of a circle is a ſection of the cone of rays, which, proceeding from the eye to all parts of the circumference of the circle, is made by a plane cutting them in any direction: that when the ſection of rays is taken parallel to the baſe of the cone, the figure of the ſection made is ſimilar to the baſe whence the rays proceed, that is, a circle. When the ſection is taken inclined to the baſe of rays, that then the figure made will be an oval[a]. And ſo they proceed till they have enumerated every different way a cone may be cut, and particularized the forms that would thence be aſſumed, making reference to the ſcience of conic ſections, as if convinced their readers were well verſed in that ingenious and elaborate inquiry.

With equal propriety it might be ſaid of any rectilinear figure, whether right-angled or polygonal, that a ſection of the pyramid of rays, formed by the eye viewing it, taken parallel to the baſe, will be a ſimilar figure to the original, and that, taken in any other direction, would determine a figure conſiderably different and diſſimilar. All this, though very true, forwards the ſubject nothing; and the ſtudent, unleſs acquainted with theſe truths, muſt rely ſolely on the aſſertion of his informer that it is ſo. The fact is, the operative part of all perſpective delineation is by the interſection of right lines; that when right lines are to be obtained, by finding the extremes of them, the whole line is determined, and the repreſentation of a ſolid bounded by planes is, on that account, very ſoon accompliſhed: but this is not the conſequence with reſpect to the obtaining the repreſentations of curves; a ſtraight ruler will in no way coincide with a curved line between its two extreme points. There is no mode of procedure for determining the apparent forms of curved lines, but by finding points in the curvature, and by obtaining ſuch ſufficient number of them, that the hand may be enabled to trace the curve through them with adequate correctneſs.

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[a] Except in one poſition, and that is, when the cone of rays is cut by the plane of delineation ſub-contrawiſe, as it is termed; that is, when the portion cut off is ſimilar to the whole cone, then, of courſe, the baſes of both, being ſimilar, muſt be circular. But this takes place only in inclined cones.

[Plate 18.] When the curve is irregular, as the curve ABCDEFG (Fig. 1, Plate 18), a point muſt be aſſumed at every conſiderable variation in the curve, as at B, C, D, E, F, G, and ordinates be dropped from them to the baſe or chord of the curve AH, as Bb, Cc, Dd, &c. the various heights of which ordinates being found, the curve may be traced through their top extreme points with very ſufficient correctneſs. Nor can any other mode be followed, let the curve be ever ſo regular; as a circle or an ellipſis. The only difference is, that the curve being regular, the points may be regularly aſſumed, and thereby be more eaſily found; but *however* regular the curve, it can be obtained only by finding points in its curvature. By circumſcribing and inſcribing a circle with a ſquare (as Fig. 2), eight points in its circumference may readily be obtained by ſimply finding the repreſentation of thoſe ſquares; and this, whether placed horizontally (as Fig. 3), or vertically (as Fig. 4), or inclined (as Fig. 5), and, with care, the curve may be traced through them. Eight points I conſider ſufficient for tracing the curvature of an oval, even of conſiderable magnitude; but if not thought ſo by others, more may eaſily be acquired. Points in the curvature of the repreſentation of an ellipſis, or oval, may alſo be obtained by circumſcribing and inſcribing it with rectangles, and finding thoſe rectangles, as Fig. 6: ſo of a hexagon or of an octagon, by circumſcribing them rectangularly, and drawing the regular parallel lines from one correſponding point to another, and delineating them merely, the required figure is likewiſe aſcertained by only drawing the boundary lines from the points ſo obtained (ſee Figs. 7 and 8). By finding the rectangular circumſcribing figures, and the parallel lines AB, CD, and EF, of the one, and CH, IK, LM, and NO of the other; the hexagon and octagon will be deſcribed by drawing their boundary lines from the interſecting points made by the lines of the right-angled figures before found, as CA, AD, EB, and BF, of the one, and the lines IL, NK, HO, and GM, of the other. Not but that ſuch figures may be more ſcientifically delineated by the aid of vaniſhing points, as will be ſhown by and by, but ſuch method as is now pointed out has conſiderable advantages.

EXAMPLE XII.

It is required to find the perſpective repreſentation of an irregular curved line, deſcribed on a plane ſtanding inclined to the plane of delineation.

The curve ABCDEFGH (Fig. 1, Plate 18) is the curved line; let it be inclined to the plane of delineation, IK, in the angle HIK; and let S be the ſtation point. The curve is ſuppoſed to ſtand upright on its chord or baſe AH.

Aſſume the points B, C, D, E, F, G, at the different variations of the [Plate 18.] curve, and draw the ſeveral ordinates B b, C c, D d, &c. perpendicular to the chord of the curve A H, and produce the chord line, or baſe of the curve, to I, for an interſection. Find the centre of the picture ⊙, and the vaniſhing point of the line A H, by the line S K being drawn parallel to it.

Prepare the picture (Fig. 9). Let X V be the horizon, and I L the ground line; I is the interſecting point, ⊙ the centre of the picture, and V is the vaniſhing point. Let the viſual lines through the points a, b, c, d, e, f, g, and h, correſponding with the viſual interſections at Fig. 1, be drawn.

Set up the ſeveral heights of the ordinates, Fig. 1, on the interſecting line I D, Fig. 9, at G, B, E, F, C, and D, and draw pencil lines from them to the vaniſhing point V, which croſſing the correſponding viſual lines, determine the points *B*, *C*, *D*, *E*, *F*, and *G*, through which the curve required may be traced with ſufficient accuracy.

EXAMPLE XIII.

It is required to find the repreſentation of a circle lying in an horizontal plane, and touching the plane of delineation.

Let the line M N (Fig. 10) be the length of a ſide of a ſquare circumſcribing the required circle; let ⊙ P be the horizontal line, and ⊙ the centre of the picture. The centre of the picture will be the vaniſhing point of the lines of the ſquare perpendicular to the picture, the other lines will be truly horizontal, therefore be drawn parallel to the horizon.

If the Student deſcribe a circle of diameter equal the ſide of the ſquare M N, and therein inſcribe a ſquare touching its circumference, he will find the length from a to c (on the line M N; Fig. 10) equal the length of the ſide of the inſcribed ſquare (as 8c, Fig. 2), which length he will divide and ſet off equally on each ſide the middle point b; and which is in the figure ſet down for the completion of the example enjoined.

Make ⊙ P equal the diſtance of the picture, or plane of delineation, that is, equal the diſtance of the eye from the plane of delineation; P will then be the vaniſhing point of one of the diagonal lines of the ſquare, and a point on the horizon, equally diſtant on the other ſide of the centre of the picture ⊙, would be the vaniſhing point of the other diagonal line. To obtain eight points in the circumference of the required circle proceed as follows:

Draw the lines M ⊙ and N ⊙; then the diagonal line N P, cutting the line M ⊙ in the point R; draw the line R S parallel to the line M N, and the figure M R S N will be the repreſentation of the circumſcribing ſquare of the required circle. Draw the ſecond diagonal M S, interſecting the firſt in the

[Plate 18.] point g; through which point draw the lines b g d to ⊙, and e g f, parallel to MN, which will obtain the four points wherein the inſcribed circle will touch the ſides of the ſquare, b, e, d, and f. Let the inſcribed ſquare be now deſcribed to obtain four other points in the curvature of the circle. Draw the lines a ⊙ and c ⊙, cutting the diagonals in the points i, m, n, and o, which will be the four angles of the inſcribed ſquare, and four points of the circumference of the ſought circle; which may very correctly be drawn through the eight points b, i, e, m, d, n, f, and o, as is ſhown in the figure.

EXAMPLE XIV.

It is required to find the repreſentation of a circle in a vertical plane, perpendicular to the picture, the circle touching the plane of delineation.

Let the line N V (Fig. 11) be the ſide of a ſquare circumſcribing the required circle; let P ⊙ Q be the horizontal line, and ⊙ the centre of the picture. The centre of the picture being the vaniſhing point of all lines perpendicular to the picture, will be the vaniſhing point of the top and bottom lines of the circumſcribing and inſcribed ſquares.

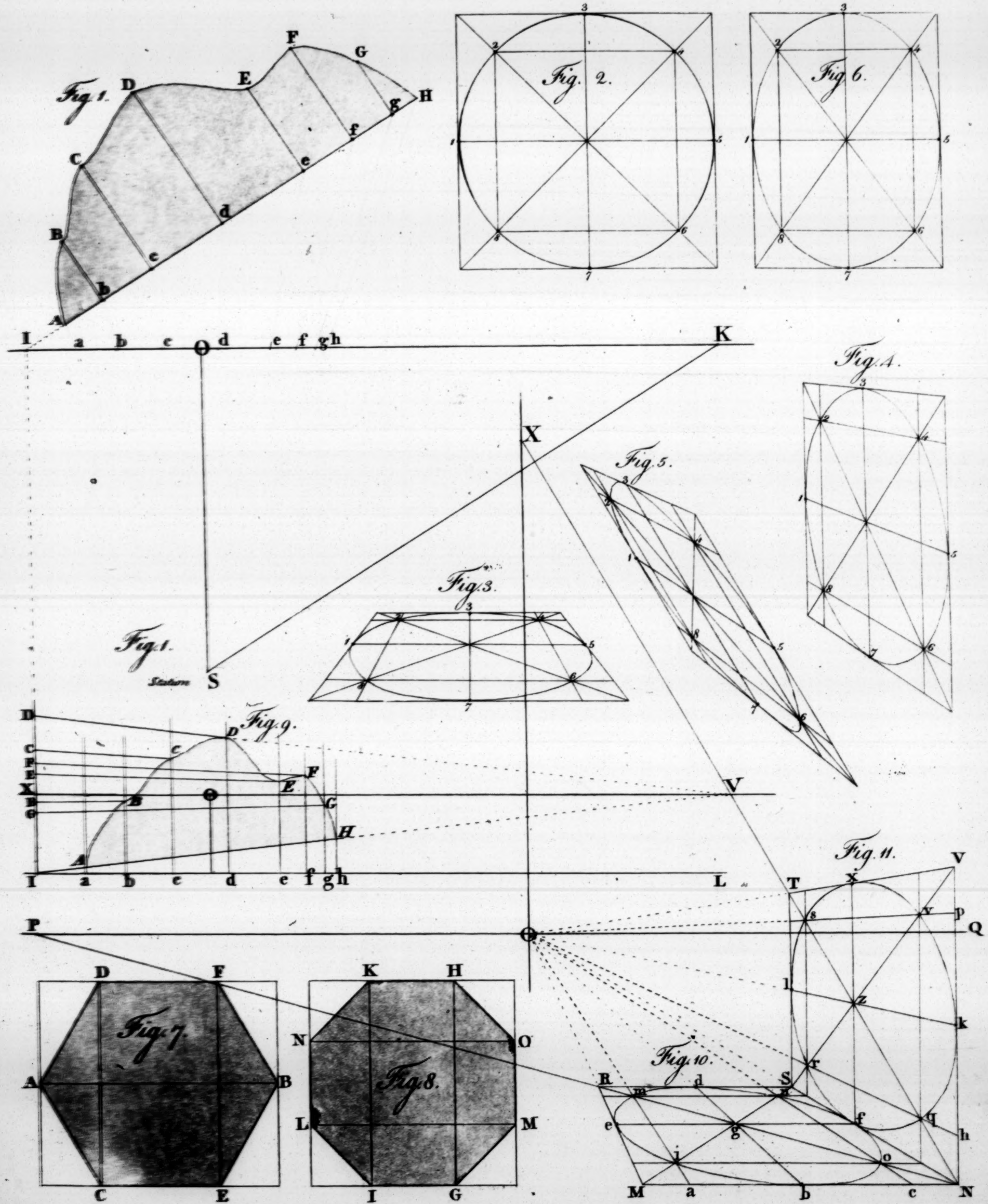
As was deſired in the laſt Example, if the Student deſcribe a ſquare within a circle of the required dimenſions, he will find it equal the length h p, ſet off equally on each ſide the middle point k.

Proceed as follows. Draw the vertical line ⊙ X, which line will be the vaniſhing line of the plane of the required circle (Def. 15). Make ⊙ X equal the diſtance of the picture (Def. 10), the point X will be the vaniſhing point of one of the diagonals of the ſquare circumſcribing the required circle.

Draw the lines V ⊙ and N ⊙; draw the diagonal N X, which, interſecting the line V ⊙ in the point T, determines V T for the ſide of the ſquare; and drawing the line T S parallel to V N, completes the circumſcribing ſquare. Draw the diagonal V S, interſecting the other in the point z, the centre of the required circle; through which point draw the lines l z k, and x z f, determining the four points in which the circle comes in contact with the external ſquare, the points f, x, l, and k. To obtain the internal ſquare draw the lines p ⊙ and h ⊙, which interſecting the diagonals of the circumſcribing ſquare, determine the four angles of the internal one, which are alſo four points in the circumference of the required circle; the points q, r, s, v. Eight points in the circumference are now obtained, viz. the points k, q, f, r, l, s, x, and v; through which the curve may be traced with very ſufficient accuracy.

The two laſt Examples conſidered unitedly, will ſerve to exemplify the doctrine of vaniſhing lines; and the truth and infallibility of the rules of perſpective delineation.

PLATE 18



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When arches are in a vertical plane, and the plane of delineation placed parallel to the plane they are in, they muſt then be truly geometrically drawn on the picture, their decreaſed dimenſions, agreeably to their diſtance from the picture, muſt be obtained, which biſected, the arch muſt be ſtruck on that centre. But when they are drawn as ſituated in planes inclined to the plane of delineation, that is, when they are the repreſentations of original arches ſtanding inclined to the plane of delineation, then will they vary each from the other, agreeably to their place and diſtance, and in juſt relation thereto.

When arches are of equal magnitude, on the ſame level, and in the ſame plane, as are the arches of a long arcade, the trouble of finding their apparent curvature, when inclined to the picture, is but little, as the ſame heights of the ordinates that ſerve for the finding of one ſerve for all, were they ever ſo many.

EXAMPLE XV.

[Plate 19.]

Let the three equal arches, No. 1, *No.* 2, *and No.* 3 (*Fig.* 1, *Plate* 19), *ſtanding in a plane inclined to the plane of delineation*, IK, *in the angle* RIK, *be required to be delineated; and let* S *be the ſtation of the obſerver.*

When arches are not drawn to a large ſcale, three points found in their curvature between their extremes, or ſpringings, will be ſufficient to trace their curves through. In the arches here required to be drawn, let the points c, d, e, No. 1; h, i, k, No. 2; and n, o, p, No. 3; be the points of the ordinates, taken all equally diſtant from their centres. The viſual lines drawn from each of the ordinates, alſo from the extremes of the ſpan of each arch, to the ſtation S, will cut the plane of delineation in the points a, b, c, d, &c. Produce the plane of the arches to the plane of delineation for an interſection at I.

Let the three arches be ſuppoſed to be ſeen below the horizon, which let be equal the height IX, Fig. 2. The line XV will be the horizon, and IG will be the ground line. Set off the diſtances of the interſections of the viſual rays a, b, c, d, &c. Fig. 1, from the interſecting point I, on the ground line IG, Fig. 2, a, b, c, d, &c. and draw the viſual lines perpendicularly through them, and alſo a vertical line through the interſecting point I.

On the interſecting line IX, Fig. 2, ſet up the heights of the ordinates taken, of the required arches, that is, make It, and Iv, equal the ordinates ct, and dv, Fig. 1, and draw the lines IV, tV, and vV, Fig. 2, cutting the viſual lines of the ordinates, in the points 1, 2, 3, No. 1; 4, 5, 6, No. 2; 7, 8, 9, No. 3; through which points the curves may be drawn from the ſpringing of the arches with a ſteady hand with ſufficient accuracy.

[Plate 19.]

EXAMPLE XVI.

Suppoſe the arches of the laſt example were required to be drawn above the horizon, at any height at pleaſure, ſuppoſe at the height I N, *Fig.* 3; *the horizon and ſtation remaining as before.*

The ſtation and poſition of the arches being as before, the ſame viſual lines with the laſt, both in plan and elevation, will ſerve; it will only be neceſſary to heighten the viſual lines, Fig. 2, to Fig. 3.

Make N x and N z, Fig. 3, equal the heights of the ordinates c t, and d v, of the plan Fig. 1, and draw the lines N V, z V, and x V, cutting the viſual lines of the ordinates and ſpringings in the points o, o, o, o, o, &c. through which the curves may with care be traced.

Fig. 4, ſhows an arcade, ſtanding on piers, agreeably to the dimenſions and height of the arches of the laſt example.

Should the arches be unequal, as the arches of a bridge generally are, ſtill the ſame mode of drawing ordinates, and finding their heights according to their diſtance, muſt be purſued. The arches differing in dimenſions or in figure, that is, being either ſemicircular, ſegments of circles, or ſemi-ellipſes, will cauſe only a little more trouble in the operation of finding them.

EXAMPLE XVII.

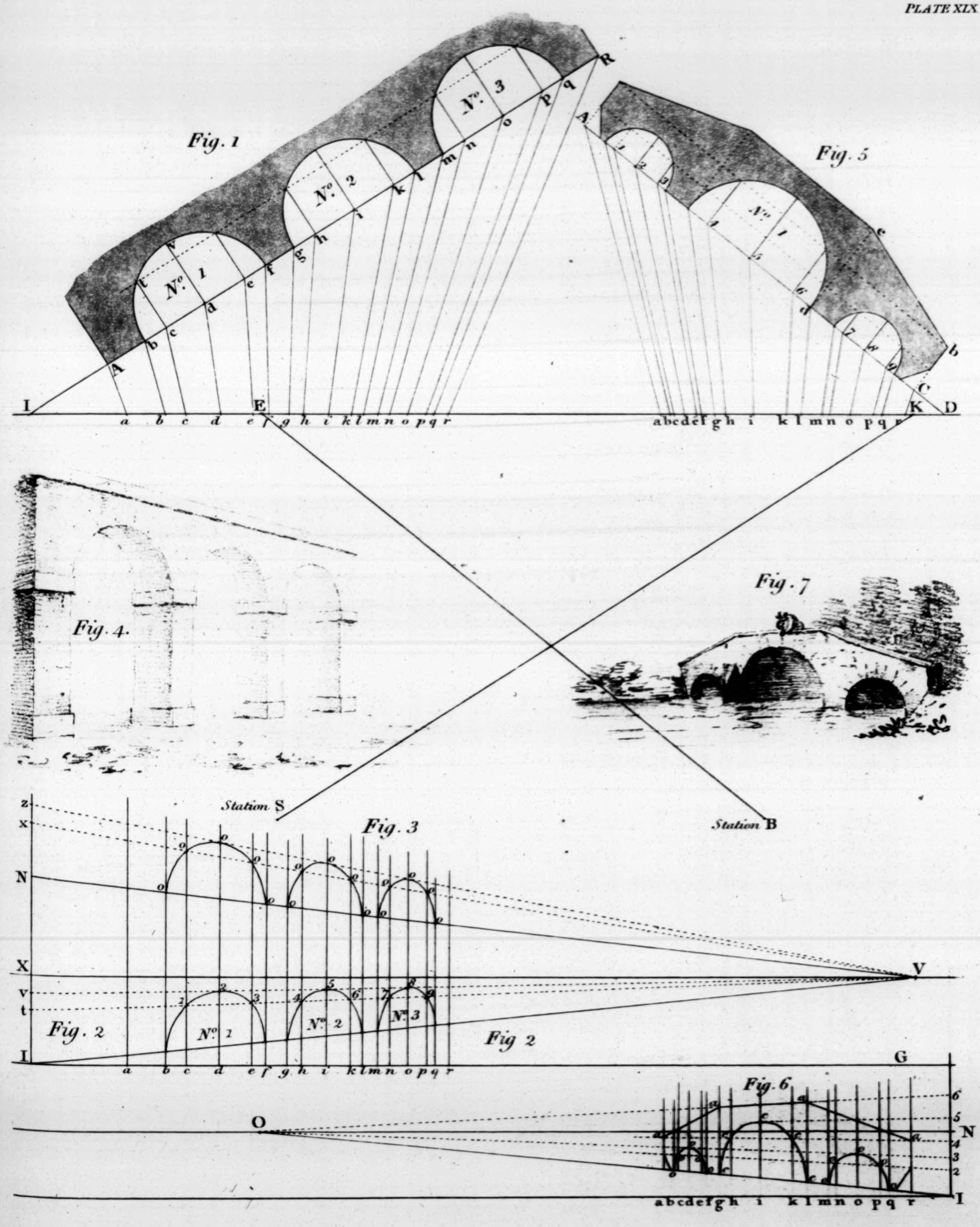
Let Fig. 5, be the geometrical elevation of a bridge. Let it be ſuppoſed to ſtand perpendicularly on the line A C; and let B be the ſtation whence it is viewed. Let I K be the ground line of the plane of delineation.

It is required to find the perſpective repreſentation of the above bridge, under the ſtated premiſes, ſuppoſing the horizon equal the height I N, *Fig.* 6.

Let the ordinates of the different arches be regularly aſſumed; and from their points of interſection, 1, 2, 3; 4, 5, 6; 7, 8, 9, on the chord line A C, let viſual rays be drawn to the ſtation B, as alſo from the piers or ſpringing of the arches, cutting the plane of delineation in the points a, b, c, d, e, &c.; and let the chord line A C be produced to D for an interſection. Draw the line B E, from the ſtation B, parallel to the chord of the arches, A C, for the vaniſhing point of horizontal lines in that direction.

Draw the horizontal line O N, Fig. 6, and parallel to it the ground line through the point I. Make N O equal the diſtance D E, Fig. 5, and ſet off the diſtances of all the viſual rays, D a, D b, D c, &c. Fig. 5; at I a, I b, I c, &c. Fig. 6, and draw the viſual lines through them.

PLATE XIX.



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Firſt, to obtain the points in the curvature of the two ſmall arches, which [Plate 19.] being of a ſize, and their ordinates of equal height, the operation of finding the heights of the perſpective ordinates will ſerve for both, as was ſhown in the laſt example. Make the heights I 2, I 3, on the interſecting line I N, Fig. 6, equal the heights of the ordinates of the ſmall arches, Fig. 5, and draw the lines 3 O, 2 O, and I O, cutting the viſual lines of the arches in the points o, o, o, o, o, and o, o, o, o, o; through which points the curve may be traced, as is there done[a]. On the interſection, Fig. 6, make I 4, and I 5, equal the heights of the ordinates of the centre arch No. 1, Fig. 5; and draw the lines 5 O and 4 O, cutting the viſual lines of the centre arch in the points c, c, c, c, c; through which the curve may readily be drawn. I 4 and I 6 are equal the heights of the coping of the bridge C b and d e, Fig. 5; from which points, if lines be drawn to their vaniſhing point O, the proper viſual lines will be interſected, as in the figure, in the points *a*, *a*, *a*, *a*; joining which points, by right lines, completes the entire of the bridge, and, cleared of its operative lines, and ſhaded, would be as Fig. 7.

Thus, by finding of points in the curvature of regular or irregular lines, are their apparent forms obtainable, nor can there be any other method deviſed, by which that end can be effected.

EXAMPLE XVIII. [Plate 20.]

Let it be required to find the apparent form of a circular ſtructure, part cylindrical, part conical, in the ſhape of a potter's kiln. Fig. 1, Plate 20, is the geometrical elevation of the given ſtructure; its baſe, A B C D, cylindrical; its ſuperſtructure, B E F C, conical. The circle a a a a, &c. Fig. 3, is the plan of the baſe, and the ſmall concentric circle 4 4 4 4, &c. the dimenſions of the circle of the top of the conical part, at E F, Fig. 1.

It is required to find the apparent form of ſuch a figure, from the ſtation S, *the plane of delineation being at* V Z, *and the height of the horizon being equal the height* A G, *Fig.* 1.

Circumſcribe and inſcribe the two circles of the plan Fig. 3, by ſquares, and draw viſual rays from the angles of thoſe ſquares to the plane of delineation. Produce the diagonal of the ſquares M K to I for an interſection, and draw a line from the ſtation parallel to the diagonal, to obtain its vaniſhing point, which will be diſtant from the centre of the picture ⊙, equal the diſtance S ⊙.

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[a] The Student is adviſed to practiſe this Example to a much larger ſcale.

[Plate 20.] A line from the ſtation S, drawn to the picture, parallel to the diagonal of the plan, would not come within the limits of the plate; half the diſtance is therefore taken, at s, and the line s Z drawn. ⊙ Z will then be half the diſtance of the vaniſhing point, that is, ⊙ Z will be equal ⊙ s, or half ⊙ S.

Firſt, to the delineation of the cylindrical baſe. The two circles of the top and bottom being equal and parallel, 'tis only requiſite to find them, and being joined together by the external vertical lines, tangents[a] to them both, the whole figure is completed, as is ſhown, Fig. 5.

Prepare the picture, Fig. 4. The line KK is the horizon, and LM the ground line, diſtant from each other equal the height AG, Fig. 1. From the centre of the picture ⊙, ſet off the diſtances of the ſeveral interſections of the viſual lines from the plan Fig. 3, as alſo the interſecting point of the diagonal, I, at the correſponding letters b, c, e, and f, and L, Fig. 4. Draw the interſecting line LP, and the viſual lines of the ſquares through the points b, c, e, and f, and make ⊙ d on the horizon equal the diſtance of the vaniſhing point of the diagonal, that is equal twice ⊙ Z, Fig. 3.

On the interſecting line Fig. 4, ſet up LE, equal the height of the cylindrical baſe of the object AB, Fig. 1; and draw the lines Ed and Ld cutting the viſual line of the exterior angle of the ſquare in the points m and n, and draw the horizontal lines m o and n p, to the viſual line through the oppoſite angle of the ſquare. Then draw the lines m⊙, n⊙, o⊙, and p⊙, and v w and r t, completing the circumſcribing ſquares of the top and bottom circles. Draw the other diagonals, VO and r p, which, interſecting, determines the centres of each of the circles, through which centres, diameters being drawn to the middle of the ſides of the ſquares, the four points are obtained wherein the inſcribed circle touches the ſides of the ſquare.

The diagonal lines Ed and Ld alſo cut the viſual line of the angle of the inſcribed ſquare in the point 2; and drawing the line 2 3, and the lines 2 4, and 3 5, to ⊙, the internal ſquare 2 4 5 3 is determined, and four other points in the curvature of the required circle are obtained; through which eight points the curve may very well be drawn. The ſame is to be done of the circle above the horizon, but it being ſo contracted in its appearance, from its nearneſs to the horizon, the proceſs of obtaining it can better be traced from inſpection of the figure, than by deſcription. Draw the vertical lines *a b* and *c d*, tangents to the above curves, and the baſe of the figure will be completed; the extent of which will be found to be exactly the ſame with the ſquare comprehended between the points of interſection x and z, Fig. 3, where viſual rays from the ſtation are tangents to the cylindrical baſe of the object. [Plate 20.]

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[a] A Tangent to a circle, or other curve, is a right line which juſt touches the curve, and of courſe in nowiſe coincides with it, but the curve quits it immediately on each ſide.

To obtain the circle of the top of the object, draw the diagonal line Pd, firſt making the height L P, on the interſection, equal the height TR, Fig. 1.

The ſhort lines *e*, *f*, *g*, and *h*, are the viſual lines anſwering to the viſual interſections *o*, *o*, *o*, *o*, (Fig. 3,) of the two ſquares circumſcribing and inſcribing the circle of the top, which interſections are ſet off from the centre point B, the ray of the dotted viſual line in the middle of the object Fig. 4. Where the line *e* interſects the diagonal line Pd, draw the horizontal line *e*, *h*, and the lines *e* ⊙, and *h* ⊙, to their vaniſhing point ⊙. Where the line *h* ⊙ interſects the diagonal line at *i*, draw the horizontal line *i k*, and the circumſcribing ſquare *e h i k* will be completed. Draw the other diagonal line of the ſquare, and through the centre of the ſquare draw the lines o o, and o o, determining four points of the curve of the circle. The inner ſquare is obtained in like manner with the foregoing, from the lines f, and g, by which four other points are had in the curvature, 3, 3, 3, 3; through which eight points the circle may eaſily be traced. The circle of the top, and the circle of the baſe, being joined by the tangent lines *o b*, and *o d*, the whole required figure is completed.

EXAMPLE XIX.

Let it be required to find the repreſentation of a circular object, of which let Fig. 2 be the geometrical elevation. The baſe A B C D is the ſame as the baſe of the former object, but the ſuperſtructure is ſomewhat different, as well as more complicated; the conical part being the form H I K L. The circular plan, Fig. 3, is as well the plan of the preſent as of the former object, with the addition of two circles expreſſing the dimenſions of the ſtructure at H L and I K. The circle of the gallery is the ſame, in diameter, as that at H L, and the top the ſame with E F of the former object.

It is required to find the perſpective of the above object, Fig. 3 being the plan and ſituation with the plane of delineation V Z, *and* S *is the ſtation.*

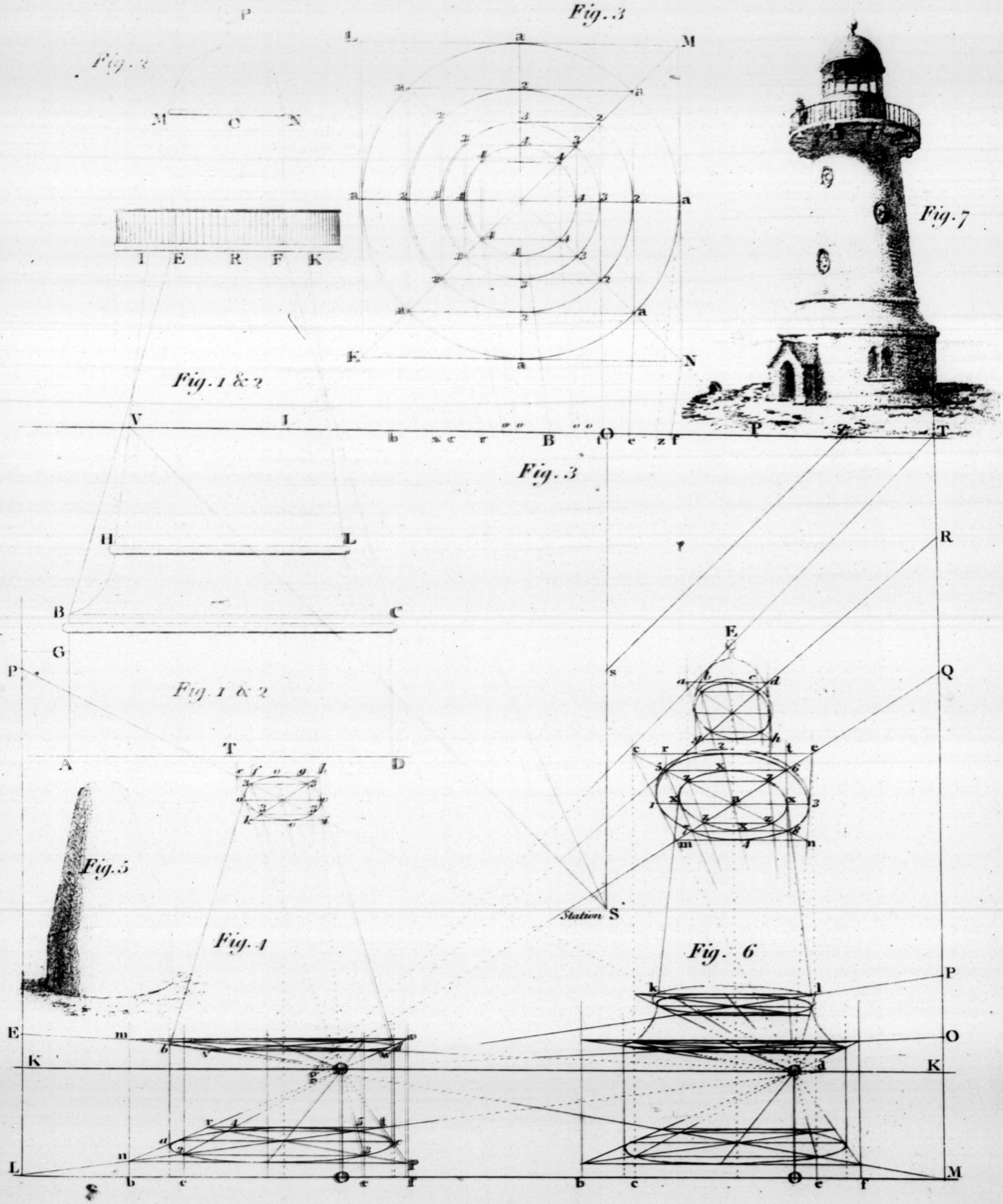
Let each circle of the plan, Fig. 3, be inſcribed and circumſcribed by a ſquare; and from the angles of thoſe ſquares, let viſual rays be drawn to the plane of delineation, and let the general diagonal, L N, be produced to P for an interſection with the picture.

Let L M, Fig. 6, be the ground line of the picture, and let K K be the horizon. ⊙ is the centre of the picture, and g, on the horizon, is the vaniſhing point of the diagonal line, ⊙ g being equal the diſtance ⊙ V, Fig. 3.

[Plate 20.] The viſual lines through the points b, c, e, and f, Fig. 6, are the viſual lines from the near angles of the two ſquares of the great circle of the baſe of the object. The height MO, on the interſection, is the height of the baſe of the object, equal the height DC, Fig. 2. The baſe of the preſent example being exactly the ſame with that of the former, it is needleſs to go through the proceſs of obtaining it; the practice of the preceding, and inſpection alone of this, will be ample information as to its attainment. MP, on the interſection, is the height of the circle HL, Fig. 2. The line Pg being drawn, interſects the viſual line of the angle of the ſquare, determining the point l of one of the near angles of that circumſcribing ſquare; from which point the whole may be readily completed; but which proceſs being the ſame with the finding the circle of the gallery above, we will proceed to the deſcription of it, as, being more diſcernible, it will better anſwer the purpoſes of both.

Draw up the viſual lines cc, and ee, the viſual lines of the two near angles of the ſquare circumſcribing the required circle. Make MQ, on the interſection, equal the height of the gallery TR, Fig. 2, and draw the diagonal line Qg interſecting the viſual line ee, in the point e, anſwering to the point l of the ſquare below. Draw the horizontal line of the ſquare ce, and from the points c and e draw lines to ⊙, the vaniſhing point of lines perpendicular to the picture. The line from the point c interſects the diagonal in the point m, from which draw the line mn, parallel to ce, completing the ſquare ecmn; in which, draw the other diagonal cn determining the centre of the circle a. Through the centre, a, let two lines be drawn through the ſquare, one parallel to ce, and the other in direction to the vaniſhing point ⊙, which will obtain four points, 1, 2, 3, 4, in the circumference of the circle. The ſhort lines r and t, anſwer to the viſual lines of the near angles of the inſcribed ſquare, agreeable to the viſual interſections r and t, Fig. 3. Thoſe lines interſect the diagonals in the points 5 and 6, from which, lines being drawn in direction to ⊙ determine the two other angles of the ſquare, and points in the circle, 7 and 8; through which eight points let the circle of the gallery be drawn. The ſquare 5678, is the exterior ſquare of the circle of the body of the object at top, in which, four points are already determined, x, x, x, x; and the four other points, z, z, z, z, are readily obtained from the viſual interſections oo of that ſquare in the plan Fig. 3, and the circle drawn through them; draw the lines of the conical body of the object xk and xl. There only remains to find the top circle at MN, Fig. 2.

PLATE XX.



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[Plate 20.]

Make MR, on the interſection, equal the height TO, Fig. 2, and draw the diagonal line R g, which cutting the contiguous viſual line *d*, determines the point *d*, one of the angles of the outer ſquare; from which point, the ſquare *dagh* is obtained. The viſual lines *a*, *b*, *c*, *d*, anſwer to the viſual interſections o, o, o, o, from the angles of the correſponding ſquare in the plan Fig. 3. The proceſs of obtaining the inner circle being the ſame with either of the preceding caſes, the mere inſpection of the figure will ſuffice as to the proceſs, and convey very ample information. The height MT, on the interſection, Fig. 6, is the height of the centre of the ball, equal the height TP, Fig. 2; and the line Tg being drawn, where it cuts the dotted line through the middle of the object, at E, is the place of the centre of the ball in the repreſentation. Thus is the whole that is neceſſary to be obtained ſtrictly by rule accompliſhed; the other lines and additions to the general figure are eaſily ſupplied by the hand and judgment. It would be perfectly irkſome to obtain every minutia by rule; the leading figure and features being found, if the judgment cannot trace the reſt, little will be done by ſuch a hand.

The required lines being drawn in ink, and the operative lines rubbed out, the object will remain diſencumbered, which ſhaded, may be, as Fig. 7, not unlike the light-houſe on the pier at Ramſgate, whence the idea was taken.

[Plate 21.]

The mode that has been adopted to find the perſpective of a circle, by obtaining eight points, regularly aſſumed, in its circumference, would as well have obtained the repreſentation of an octagon, if, in place of tracing a curve through each two points ſo as it ſhould fall in a flowing unbroken line through the ſucceeding, they had been joined together by right lines, chords to thoſe ſame curves; as is ſhown geometrically Fig. 1, Plate 21, and perſpectively in Fig. 2. But a ſtill more ſimple method would be as before recommended and ſhown, Fig. 8, Plate 18, by drawing and finding the parallel lines from the extremes of the oppoſite ſides; which we will now put in practice.

EXAMPLE XX.

Figure 3, Plate 21, is an octagon, around which, let a ſquare IKLM be deſcribed; let the parallel lines CF, BG, and AD and HE, be drawn.

It is required to find the perſpective appearance of the above octagon, by finding the circumſcribing ſquare, and the parallel lines within, from a given ſtation and point of view.

Let the line VX be the place of the plane of delineation parallel to a ſide of the ſquare. Let S be the ſtation. The centre of the picture ⊙ will be the va-

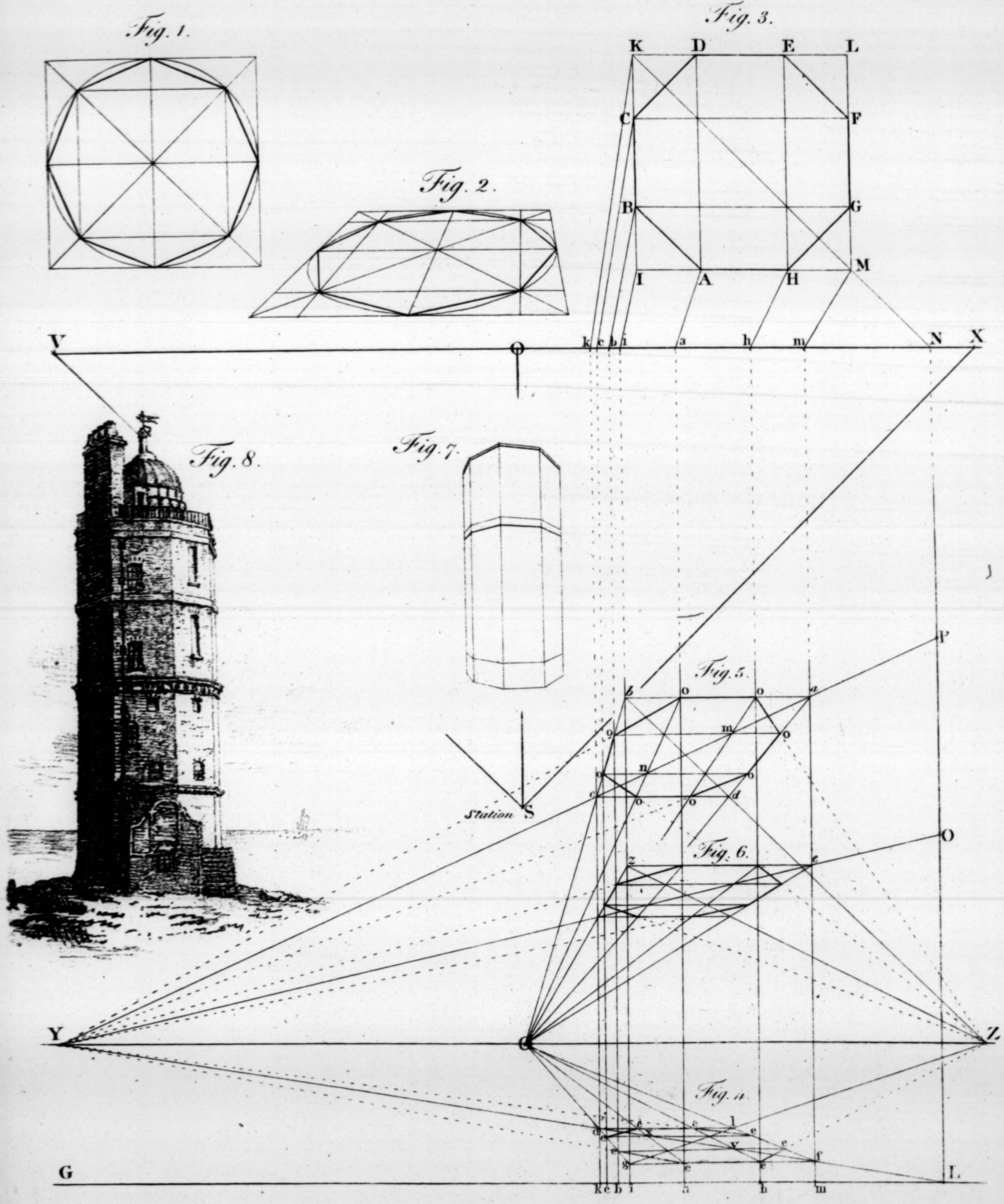
[Plate 21.] niſhing point of the lines perpendicular to the picture; and the diſtance of the picture S ⊙, laid down on the horizon, on each ſide the centre ⊙, will give the vaniſhing points of the diagonals of the ſquare. Draw the viſual rays in direction to the ſtation cutting the plane of delineation in the points k, c, b, i, a, h, m, and produce the diagonal KM to N for an interſection.

Prepare the picture, Fig. 4, by drawing the ground line GL, and parallel to it, the horizon, YZ. ⊙ is the centre of the picture, and ⊙ Y and ⊙ Z are each equal the diſtance of the picture S ⊙ in the plan, wherefore Y and Z are the vaniſhing points of the diagonals of the ſquare, and of all lines parallel to them. The viſual lines through the points k, c, b, i, a, h, and m, anſwer to the correſponding viſual interſections in the plan. L, in the interſecting point, and LN, the interſecting line. We will firſt obtain the repreſentation of the octagon as lying in the ground plane.

Draw the diagonal line LY, from the interſecting to the vaniſhing point. The point f, where it cuts the viſual line through the point m, is the place of the near horizontal ſide of the ſquare, fg. Draw the lines g ⊙, f ⊙, and dl, which will complete the ſquare fgdl, of which, the line df is a diagonal. From the points e and e, where the viſual lines through the points a and h touch the near ſide of the ſquare, draw the lines e ⊙, and e ⊙, croſſing the oppoſite ſide of the ſquare in the points e and e; and where they croſs the diagonal df in the points v and x, let horizontal lines be drawn through thoſe points to the oppoſite ſides of the ſquare, cutting them in the points e, e, e, e; and drawing the corner lines ee, ee, &c. the octagon e, e, e, e, e, e, e, e, is completed.

Let it be required to find the appearance of the ſame octagon, as ſeen elevated above the horizon, directly over the one found on the ground plane; ſuppoſe equal the height LP *on the interſection.*

Draw the viſual lines of the ground figure up to Fig. 5. Where the diagonal line PY croſſes the near viſual line in the point *a* is the place of the near ſide of the ſquare around the octagon, and the horizontal line *ab* is that ſide. Draw the lines *b* ⊙, *a* ⊙, and *cd*, completing the ſquare *abcd*. Where the viſual lines, through the points a and h below, croſs the ſide of the ſquare *ab*, at o, o, let lines be drawn to the centre, ⊙, croſſing the oppoſite ſide of the ſquare *cd*, in the points oo; and where they croſs the diagonal line in the points m and n, let horizontal lines be drawn through thoſe points to the other ſides of the ſquare, cutting them in the points o, o, and o, o; the remaining ſides of the octagon at the corners being joined together, the whole octagon o, o, o, o, o, o, o, o, is completed, as required.



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[Plate 21.]

Thus, at whatever height required, the proceſs of finding the figure is with facility performed: as ſuppoſe at the height LO, on the interſection; the diagonal line OY being drawn, cuts the near viſual line, Fig. 6, in the point *e*, whence is drawn the ſide of the ſquare *e z*; from which the whole may be completed by the ſame proceſs as before ſhown in Figures 4 and 5.

The diagonal vaniſhing points Y and Z are as well the vaniſhing points of the corner ſides of the octagon, as of the diagonals of the ſquare; for thoſe ſides of the octagon are parallel to the diagonals (ſee the plan, Fig. 3); they will therefore have the ſame vaniſhing points. In the figures juſt obtained, if a ruler be applied to thoſe lines, they will be found to tend correctly to their ſeveral vaniſhing points; to which they are continued, in the figures, by dotted lines agreeably to their direction. Thus will the uſe of thoſe vaniſhing points contribute to the correctly delineating the figure, and at the ſame time illuſtrate the truth and beauty of the rules of perſpective.

Joining the correſponding points of the octagons, above and below, by perpendicular lines, a ſolid figure will be formed, like to Fig. 7, or like to Fig. 8; where the rules, but juſt performed, are exemplified in an appropriate figure, and which is a view of the light-houſe on the North Foreland near Margate.

Thus by a very ſimple method may, apparently complicated figures be obtained, with the utmoſt correctneſs and facility. Thus may a hexagon be deſcribed (ſee Fig. 7, Plate 18), and ſo of any other regular polygon.

I will give one more example of general figures, more complicated than any that has hitherto been deſcribed; and after performing it, will proceed to give ſome general rules, governing the proceſs of taking views, whether of ſingle or many objects. This ſhall cloſe the firſt diviſion of my ſubject, which ſhall be reſumed again with an inquiry into many intereſting particulars and minutiæ, whereby a more intimate knowledge cannot fail of being obtained.

EXAMPLE XXI.

[Plate 22.]

Let Figure 1, Plate 22, be the general plan of a church, which, like moſt country churches, let be compoſed of ſeveral parts. Let ABCD be its body; EFGH its tower; IKLM, and MLNO, be ſubordinate parts of the building; and let a b c d be the porch. Let Fig. 2, be its geometrical elevation; the ends and meaſurements *AB* and *BC*, anſwering to IM and MO in the plan Fig. 1; and the points of the roofs *D*, *E*, and *F*, Fig. 2, anſwering to the lines of the ridges QR, TV, and PL, Fig. 1.

[Plate 22.] *It is required to find the perſpective repreſentation of the above building, on the plane of delineation* Y Z, *the ſtation being at* S.

Find the vaniſhing points Y and Z, of the horizontal lines of the building by the lines S Y and S Z being drawn from the ſtation parallel to them. ⊙ is the centre of the picture. Draw the viſual rays from the viſible angles of the object, in direction to the ſtation S, till they interſect the plane of delineation.

When a complicated object is to be drawn, that is, when it is compoſed of many parts, it neceſſarily gives riſe to a number of viſual rays for the preciſe determination of thoſe parts, and the whole together will form an apparently confuſed number of lines. But the eye that views them properly ſees no confuſion in them; it views them as the eye of the aſtronomer views the ſtarry hemiſphere, placing each cluſter, and arranging each ſtraggling brilliant in its proper ſign.

To avoid confuſion of rays in a very complicated object, it is adviſable to uſe different coloured inks in the claſſing of the rays, as alſo different degrees of ſtrength of thoſe colours to particularize different parts.

In the delineation of ſuch an object as the preſent example, the firſt conſideration is the choice of a proper interſection; for although any interſection will do, one ſhould be choſen, which ſhould unite moſt parts in its direction, with the greateſt exactneſs and leaſt trouble. In the preſent inſtance, none ſeems ſo eligible as the direction of the roof P L M, which let be produced to W.

In the picture, Fig. 3, G L is the ground line; let G V be the height of the horizon, the line VX will then be the horizontal line. ⊙, in the horizon, is the centre of the picture, from which, place the diſtances of the horizontal vaniſhing points ⊙V, and ⊙X, equal the diſtances ⊙Y and ⊙Z, Fig. 1. A B, Fig. 3, is the interſecting line, and all the viſual lines on the plane of delineation are drawn agreeably to their interſections on the ground line in the plan.

On the interſecting line, the height A C is made equal the height *AG* of the elevation, Fig. 2; and the lines C c and A a being drawn in direction to the vaniſhing point V, determine the height ac, the height of that part of the building on the viſual line anſwering to the ray from the point M in the plan Fig. 1. Through the points a and c draw the lines d e and b f to their vaniſhing point X, determining the plane bdef, the repreſentation of the plane *AGHC*, Fig. 2; the viſual lines bd and fe anſwering to the rays from the points I and O, in the plan. Draw the lines dh and bg tending to their vaniſhing point V, to the ray from K in the plan, completing the plane bghd. On the interſection, make the height A D, equal the height of the roof *NE* of the elevation Fig. 2, and draw D i in direction to V; through i draw the line k l, to the vaniſhing point X, touching the viſual lines of the roofs in the

[Plate 22.]

points k and l; draw the lines km, mh, kd, kc, lc, and le, which will complete the whole of the ſtructure over the plan IKNO, Fig. 1.

The height of the roofs of the low buildings is equal the height of the upright walls of the body of the ſtructure, as is ſhown by the line *PR*, in the elevation Fig. 2; wherefore, the line mo, and the return line on, may be drawn to the viſual lines correſponding with the interſections from the angles A and B of the plan. Alſo, from the angle g, the line gs may be drawn, which will determine the lines sr, rt, and tp, of the porch. Make AE, on the interſection, equal the height of the roof *BF* in the elevation, and draw the line EV, determining the ridge of the roof between the two viſual lines from the points P and L of the plan. Draw the lines of the gable end vo and vz; the point z is obtained by the line om being drawn to its vaniſhing point X, cutting the viſual line from the angle D of the plan, in the point z.

Make AG and AF, on the interſection, equal the heights of the tower, *BO*, and *BM*, of the elevation, and draw the lines GV and FV, cutting the viſual line from P in the plan, in the points *a* and *b*; through which points draw the lines *ac* and *ef*, to their vaniſhing point X; and the lines *cd* and *eg*, to their vaniſhing point V; the points *g*, *e*, and *f*, being in the proper viſual lines from the angles of the tower F, E, and H, in the plan. Complete the tower by drawing the lines *dg*, *de*, *ae*, and *af*.

The preſent example was contrived to elucidate the general practice of vaniſhing points, which are as well to be obtained of other poſitions of lines, as horizontal ones. It is not always that the vaniſhing points of inclined lines are required, but they are often uſeful, and ſometimes abſolutely neceſſary. In the geometrical elevation, Fig. 2, the lines *MO*, *PF*, *GD*, *IE*, are all parallel lines, as alſo are the lines *OV*, *FR*, *EH*, and *DI*; and though ſituated in different, yet they are in parallel planes, and will therefore have a common vaniſhing point. A line drawn perpendicularly to the horizon through the vaniſhing point X (Fig. 3), as LQ, will be the vaniſhing line of the plane of the end of the church over the line IO of the plan, alſo of the end of the body AD, likewiſe of the ſide of the tower EH. And a line drawn through the point V (Fig. 3), perpendicularly to the horizon, as GM, will be the vaniſhing line of the planes over the lines (Fig. 1), IK, AB, ab of the porch, and FE of the tower; and all lines in thoſe planes, or the boundaries of thoſe planes, will have their vaniſhing points ſomewhere in thoſe vaniſhing lines[a].

To obtain the vaniſhing points of the inclined lines of the roofs and tower,

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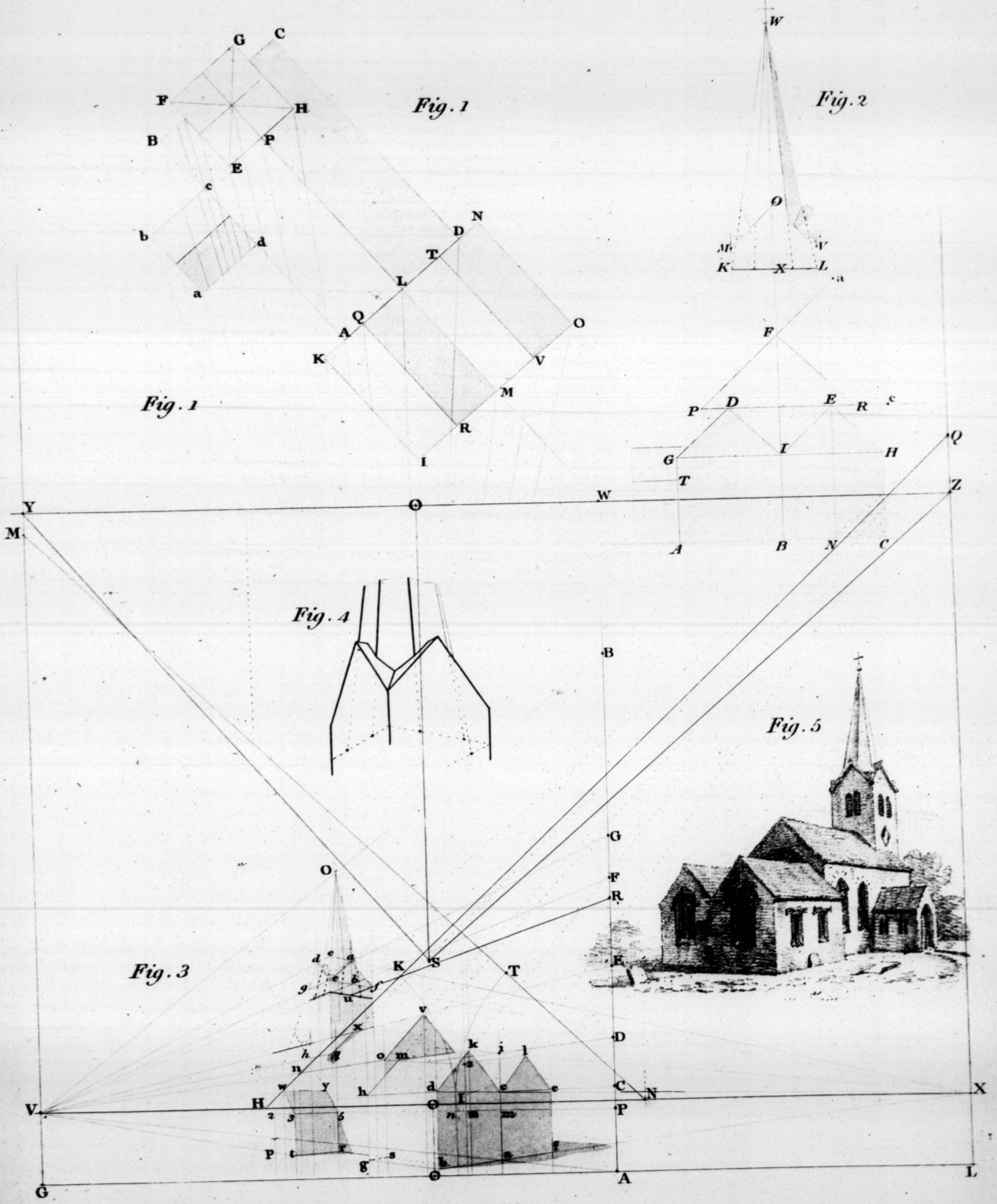
[a] This circumſtance of finding the vaniſhing points of inclined lines was before treated on in Example 8, Fig. 5, Plate 15; but here it is more fully exemplified.

[Plate 22.] proceed as follows: take the diſtance of the vaniſhing point Z, from the ſtation S, in the compaſſes; that is, take the length of the line S Z, and apply it on the horizon from X to H. At the point H make an angle with the horizontal line, equal the angle of the roofs a *P* c, Fig. 2; the curve K I, and the diſtance of it from the centre H, being equal to the curve a c, and diſtance of it from its centre *P*; then is the angle K H I equal the angle of the roof a *P* c, Fig. 2. Produce the line H K to Q; Q will be the vaniſhing point of the line *e a* of the tower, alſo of the parallel lines o v, d k, and c l; which, though obtained by a different proceſs, will all be found, by application of a ruler, to tend truly to that point, as is ſhown by the dotted lines in the example.

A like proceſs being performed of the diſtance of the vaniſhing point Y, from the ſtation S, will obtain the vaniſhing point of the ſame inclination of lines in the other planes of the object. Take the length S Y in the compaſſes, and ſet it off on the horizon, from V to N. At the point N, make an angle I N T, on the horizon, equal the angle K H I, that is, equal the angle of inclination of the roof, a *P* c, Fig. 2. The line N T produced to M in the vaniſhing line G M, will be the vaniſhing point of the line *de* of the top of the tower, alſo of the lines w 3, and y 5, of the porch (the inclination of the roof of the porch being the ſame as the other roofs of the body of the church), as is ſhown by the dotted lines in the example. The walls of the porch are obtained from the height A P, on the interſection, equal the height *AT*, Fig. 2. P *m* being drawn to the vaniſhing point V, and *m n* to X gives the lines n 5, 5 3, and 3 2.

It muſt be obſerved that the inclined lines *a f*, l e, k c, and v z, have a common vaniſhing point, obtainable if required; and which vaniſhing point will be in the ſame vaniſhing line with the point Q, and as much below the horizontal vaniſhing point X, as the point Q is above it; to which point, were it obtained, thoſe lines, already drawn, will be found exactly to tend. It is ſeldom abſolutely neceſſary to have both thoſe points; in the preſent inſtance one of them only, the point Q, is obtained, which would anſwer every end required of both; for ſuppoſing it were left to that vaniſhing point for the finding the inclined lines, the viſual lines being drawn, and the heights of the upright walls being found, the line d k drawn in direction to the vaniſhing point Q, determines one ſide of the gable-end at the viſual line in the middle; the other is accompliſhed by joining the points k and c together. So of the other gable, c l being drawn, l e is alſo had by joining the points l and e together.

To complete the whole, draw the line x *q*, on the tower, from the point x, to the angle of the tower, in direction to the vaniſhing point Q; then



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draw the lines *qh*, and n*b*, to their proper viſual lines, and vaniſhing points V and Q. The putting on of the ſpire is a work of ſome conſideration, and muſt be proceeded on with thought and care. The baſe of the ſpire is intended to be a regular octagon. If the two external lines in the geometrical of the ſpire, be continued till they touch the ſides of the tower, as is done at *K* and *L* (Fig. 2), and an octagon be there conſtructed, extending the ſquare of the tower, it will be the baſe of the ſpire. Set up the height of the ſpire *BW*, Fig. 2, on the interſection, Fig. 3, at B; alſo the height of the baſe line *KL*, at R; and draw the lines B V and R V; the firſt, cutting the viſual line through the centre of the tower in the point O, determines the height of the ſpire; the other, cutting the tower in the point u, determines its baſe. Through the point u draw a line around the tower, and find the points of the octagon in the middle of each face of the tower, to which let lines be drawn from the top O, and the ſpire and whole object will be completed, as is ſhown in the Example. [Plate 22.]

I have now gone through the proceſs of finding the above complicated object. I had expectations of performing it with leſs confuſion of lines than the reſult has made neceſſary; but one thing ſucceeding another, and each neceſſitated to remain, for the obſervance of the ſtudent, the whole together unavoidably becomes intricate. Nor is it now ſo entirely performed, but that ſomething remains for the ſtudent to complete, but which would take more words to make clear, than the deſcription of the whole has done. What I allude to is, the interſections that take place at the lodgment of the ſpire on the top of the tower, which, for clearer obſervance, is drawn to a larger ſcale at Fig. 4; the mere inſpection of that figure will ſerve to convey a full, and I hope ſatisfactory, idea of what I allude to. The Student has alſo been left to complete the baſe of the octagon, which, no doubt, he is well enabled to do, or he has gone through the work to little purpoſe. As before obſerved, it is next to an impoſſibility to give ſuch thorough explanation in intricate matters as to leave nothing for the Student to exerciſe his own judgment on; however copious his inſtructor may be, there will always ſufficient remain undone to keep alive the active powers of his pupil, and give him opportunity of exerting his own ingenuity. That ſcholar muſt not ſleep who would inſtruct himſelf in ſcience from book alone.

Fig. 5 is a pictureſque repreſentation of the object juſt performed, which is the form of a church very commonly met with in the country.

Having, by the exerciſe of the foregoing examples, advanced the Student to ſome tolerable knowledge of the practice of perſpective drawing, I will now enter into an inquiry of a very important conſideration. Methodically proceeding, it ſhould have been antecedent to any practice; it is, however, ſometimes expedient to do that firſt, which in juſt progreſſion ſhould follow; as it is not until ſome inſight is had into a ſubject that the neceſſity of certain inquiries becomes evident.

It has been matter of much difference of opinion, the adjuſting what may generally be conſidered the beſt angle of viſion, within which objects ſhould be regarded to obtain the moſt agreeable repreſentation of them. For, accordingly as the angle of viſion is enlarged or leſſened, by viewing the objects near or remote, will their appearance vary, and their delineation in conſequence be affected thereby.

[Plate 23.] By the angle of viſion, or angle of view, is to be underſtood, the expanſion of the lines, proceeding from the eye, by the two extreme viſual rays embracing the whole extent of the view; and this, whether it conſiſt of one object or of many. This can clearly be explained only by reference to ſome figure. (Fig. 1, Plate 23.) Let A repreſent the plan of a manſion; let B be the ſituation of an outhouſe contiguous to the manſion; and let the places of trees be intimated by the ſpots C, C, C, and D, D, D. Let S be the ſtation or point of view whence the whole is regarded. Conſidering the manſion A, as a lone object, the extreme viſual rays Sa, Sb, form at the eye, the angle aSb; then is the angle aSb the angle of view under which that object is ſeen, Sa and Sb being the two extreme viſual rays embracing the whole extent of the object. Again, if the outhouſe B be conſidered as a lone object, then will the extreme viſual rays, cS and dS, form, at the eye, the angle cSd, being the magnitude of the angle under which that object is ſeen. And ſo of any object, the viſual rays that embrace its whole extent, form the angle of view under which it is ſaid to be ſeen. It muſt be manifeſt then, that this angle of view will be large or ſmall, as the eye is near to, or remote from the object.

Let it be intended to take both objects A, and B, into one view, with the addition of trees to the right, and to the left of them. Let viſual rays be drawn from the extreme tree on either ſide, to the ſtation S: the angle CSD is the angle of view under which the whole extent is ſeen; and the rays CS and DS are denominated the extreme viſual rays of the view.

Objects may be placed too near the eye for ſatisfactory obſervance of them; they may be placed ſo near as to pain the eye. The eye can contemplate only a point at one time; it is by its celerity and continual motion, that it becomes perfectly ſenſible of a whole, or many forms. But when an object, or many objects, widely extended, are placed too near, the traverſes of the eye in contemplation of the whole become painful. It is not neceſſary for me to account *why* it is ſo, but *that* it *is* ſo, every one muſt have experienced; and when that is the caſe, the cauſe, or the eye, is removed to a more agreeable diſtance, or the head, as well as the eye, is turned from one ſide to the other, the better to comprehend the extent of the object or objects in view. [Plate 23.]

The neceſſity of turning the head ſhould be avoided in taking a view: a view ſhould compriſe no greater extent than the eye can agreeably contemplate at one *coup d'œil* (or glance of ſight), or than can be viewed by a pleaſing and ſatiſfactory traverſe of the eye alone; which neceſſarily confines the extent of matter, and of courſe the angle of viſion, to ſome certain limits. The eye reſts with compoſure on what it can contemplate with little trouble; not only too great an extent, but too many objects, however they may intereſt and delight at firſt, ſoon diſtract and tire the eye, a circumſtance that may account why a pictureſque bit gives more delight than an extenſive ſcene compriſing many parts.

Smallneſs of object has nothing to do with angle of view; a die, or the ſmalleſt miniature, by being placed too near the eye, may form a large angle of view, and cauſe the eye pain in obſerving it. A large extent of view, or a large picture, may be contemplated with as much eaſe as a ſmall one; it is only placing the larger at a greater diſtance. If the place of the plane of delineation be at FG (Fig. 1), then will the angle FSG be the angle of view. If a ſection of the ſame viſual rays be taken at HI, then will HI be the extent of the picture, and the angle HSI be the angle of view; but the angles FSG and HSI are one and the ſame, of conſequence the eye can contemplate either picture with equal ſatisfaction[a]; but then one muſt be placed at the diſtance SO, the other at the diſtance SP.

From whatever ſtation an object be viewed, however diſtant, or however near, it never appears otherwiſe than on reflection we know or expect it ſhould do. Far different is the caſe with reſpect to perſpective delineation on planes, according to certain poſitions. To find the repreſentation of a circle, viewed horizontally, aſſume the figure of an upright oval, as Fig. 2: or the repreſentation of a ſquare ſo poſited, aſſume the form KMNL, Fig. 2; muſt certainly excite doubt in the mind of the *young* ſtudent, as to the truth of the

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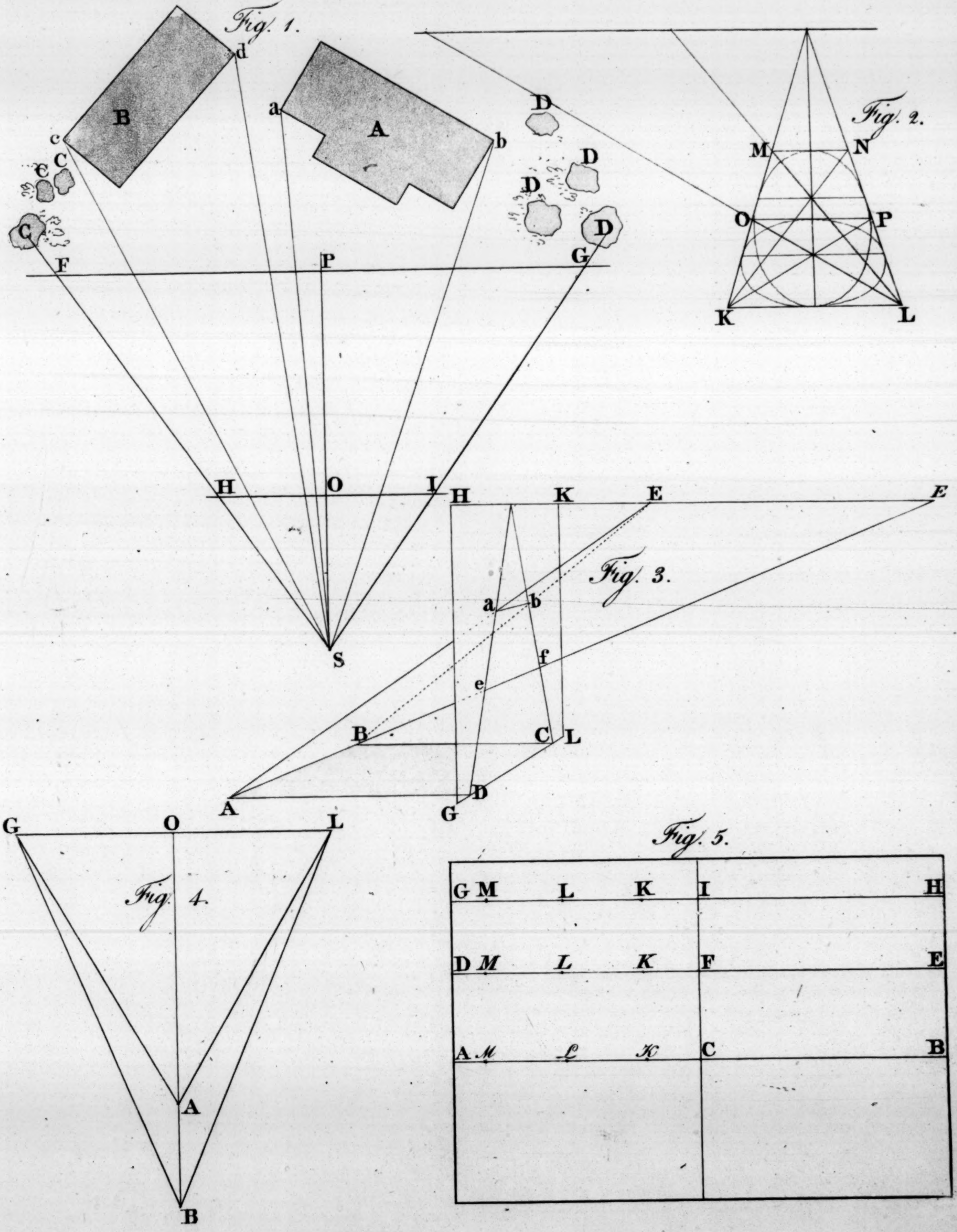
[a] In this view of the ſubject of viſion, what is termed near, or ſhort ſightedneſs, is not taken into conſideration: that is looked upon as a defect in the organ itſelf.

[Plate 23.] rules by which ſuch delineations, ſo repugnant to belief, are aſcertained, and given as the repreſentations of ſuch well-known forms. Yet ſuch may nevertheleſs be true and juſt repreſentations, according to the point of view taken, and poſition choſen of the plane of delineation.

It is the ſhortneſs of the diſtance of the eye from the plane of delineation, that cauſes ſuch unpleaſant diſtortion. This may clearly be ſeen by inſpection of Fig. 3, where, let the figure ABCD repreſent a ſquare lying on the ground plane; let the plane GHKL be the plane of delineation, and let E be the point of view. It muſt be evident by the viſual rays EA and EB, that the figure DabC, on the plane of delineation, is to the eye at E, the repreſentation of the ſquare ABCD, and that an oval deſcribed therein would, of courſe, be the repreſentation of a circle, and would be as much diſtorted as the oval within the ſquare KMNL, Fig. 2. But let the eye be removed to a greater diſtance from the plane of delineation, ſuppoſe to the point *E*, then will the repreſentation of the ſquare, and circle within, come within more admiſſible and pleaſing forms; as may be gathered by the viſual ray to the farther place of the eye *E* in the diagram, Fig. 3, determining the figure DefC as the repreſentation of the ſame ſquare; and which ſeen directly before the eye, would be as the lower ſquare KOPL, and circle within, Fig. 2.

To fix upon an angle that ſhould extend to every caſe, as being the *beſt* angle of view, would be as vain, as it would be an abſurd endeavour. Different ſubjects require different treatment; inſide ſubjects different from external ones, and external ones from each other, as they happen to be ſituated.

The angle of view, as was before obſerved, is regulated by the diſtance of the eye from the plane of delineation. Thus, if GL, Fig. 4, be the extent of the picture, and A the diſtance of the point of view, the angle GAL will be the angle of view; and ſo on, every remove of diſtance varying the angle of view of the ſame extent looked at. Some authors on perſpective have expreſſly adviſed, that the greateſt diſtance of the eye from the picture ſhould not exceed the width of the picture laterally, which makes the angle of view fifty-three degrees. Others would have the diſtance leſs, requiring the angle of view never to be ſmaller than an angle of ſixty degrees; ſuch is the angle GAL; others are for having a ſtill leſs diſtance to be the greateſt uſed, and, of conſequence, would have a larger angle of view than ſixty degrees. My Father, who, I am perſuaded, ſpeaks from more practical experience than any of his predeceſſors, adviſes the extent of the picture, laterally, to be the leaſt diſtance uſed, its angle of view fifty-three degrees, or at the very moſt, ſixty



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[Plate 23.]

degrees, to the largeſt angle of view; and recommends an angle of forty-five degrees as the beſt angle of view, being, in his opinion, neither too large nor too ſmall; ſuch is the angle GBL. It is his advice to keep between the one and the other, that is, not to let the angle of view exceed ſixty degrees, nor be leſs than forty-five; too large an angle of view ſubjecting the objects to diſtortion, and too ſmall a one rendering them too tame. His advice I know, from my own experience, to be ſtrictly good; I have, however, in ſome inſtances, in actual views, experienced the abſolute neceſſity of uſing a larger angle of view than ſixty degrees, but ſuch do not often occur. After all that can be ſaid, determination in this particular muſt ever be left to the diſcretion of the artiſt, and the abſolute neceſſity his ſubject lays him under, as to the adoption of his angle of view.

The angle of view determined, as alſo the extent of matter to be included in the view ſettled, it will then remain to place the plane of delineation in the moſt judicious manner. In regarding a picture, the obſerver, in general, places himſelf in the middle of it, between its lateral extremes, with his eye perpendicularly oppoſite to where the horizon is concluded to be, as nearly as he can determine it. Such being the ſtation whence a picture is uſually regarded, from ſuch point of view it ſhould be that the artiſt ſhould calculate his effects to be the moſt perfect, both as to linear and aerial perſpective; and which, as far as the influence of linear perſpective extends, is very eaſily effected.

The angle of view being determined, how to place the plane of delineation in the moſt judicious manner, before the eye of the obſerver.

Biſect the angle of view, and place the plane of delineation at right angles with the line of biſection; which alſo place nearer or farther from the point of view, as the picture is required to be ſmall or large.

The angle of view, FSG, Fig. 1, Plate 23, is biſected by the line SP, and the pictures FG and HI are each placed at right angles, or perpendicular to the line of biſection, SP; each of which pictures ſtands directly before the obſerver, as required: others might be thus placed, at pleaſure, agreeably to the dimenſions of the picture deſired.

From ſuch poſition of the plane of delineation, the eye of the obſerver, or, what is the ſame thing, the point of view, comes directly in the middle of the picture, laterally, with the eye level with the horizon; and from the ſtation generally choſen to regard a picture, a picture ſo proceeded on muſt make its moſt perfect appearance. In ſome caſes, however, this abſolute poſition may, and muſt be deviated from; but it is neceſſary to know where perfection is, that departure from it may be known, in order that ſuch departure may be the leaſt poſſible, agreeably to the ſubject in hand.

[Plate 23.] Let the boundary line around Fig. 5, be the dimenſions of a picture. Let the line AB be the horizon, parallel to the bottom edge, or ground line of the picture; then will the point C, in the middle, be the point that ſhould be oppoſite the point of ſight, or point of view; which point C, late writers on perſpective have termed the centre of the picture, and which has been ſo defined in this work. If the horizon, which is quite arbitrary, be placed higher on the plane of the picture, as at the line DE, then would the point F, agreeably to the principle laid down, be the moſt eligible place for the centre of the picture. If the horizon were taken ſtill higher, as in ſuch repreſentations as are termed bird's-eye views, at GH for inſtance, then would the point I be the beſt ſituation for the centre; always placing it in the middle between the two extreme ends; as then the ſpectator being directly before the picture to obſerve it, places himſelf neareſt its true and juſt point of view, which would not be the caſe, had the effects of the linear repreſentation been calculated from the point K, *K*, or 𝒦; leſs ſo if it had been calculated from the point L, *L*, or ℒ; and ſtill leſs ſo, if delineated agreeably to the point M, *M*, or ℳ, as the centre; but which, from want of knowing better, are often as erroneouſly, though unwittingly, delineated.

From what has now been advanced in this work, if thoroughly underſtood, it is poſſible to perform any thing that linear perſpective can effect; but it is apprehended, few will feel themſelves competent to ſuch a trial. There are perſons of ſuch profound thinking, ſo acutely penetrating, that from a cloſely compacted theory can extract a general practice. To ſuch, Brook Taylor's condenſed Elements on this ſubject, would be ample inſight. But works like his are not addreſſed to the many: one compacted general obſervation needs much elucidation to make it manifeſt to the multitude: wherefore the neceſſity of works of a more open inquiry, of more familiar and minute inſtruction, and according to the different powers and intention by which authors work, different roads are made to the ſame ſummit, and each who follows will prefer that path which, moſt agreeably to his humour, will conduct him to the object he wiſhes to attain.

The endeavour to avoid trouble is continually inſtanced in every occupation in life: Lazy perſons give themſelves moſt trouble, ſays the proverb. Complaint may be made of the extraordinary tediouſneſs of true perſpective delineation, and impatience may ſpurn at the apparent tediouſneſs of the proceſs. From my own experience I have ever found, when by lazineſs or impatience I have been induced to ſlight or reject the application of rule, that at laſt I have been forced to have recourſe to it, even for the advantage of that diſpatch

I was endeavouring otherwiſe in vain to obtain, and after conſiderable time had been loſt, to wave the neceſſity of the appeal. Thus had the aid of method been firſt applied to, not only much time had been ſaved, but the deluſive effect required been better accompliſhed. However ſtrong the wiſh to ſhorten the road leading to a deſired object, that way is not always found the readieſt, that ſeemingly points the moſt directly to it. Sir Joſhua Reynolds, in his divine Diſcourſes on Painting, moſt aptly ſpeaks my ſentiments; and ſays, "The impetuoſity of youth is diſguſted at the ſlow approaches of a regular ſiege, and deſires, from mere impatience of labour, to take the citadel by ſtorm. They wiſh to find ſome ſhorter path to excellence, and hope to obtain the reward of eminence by other means than thoſe which the indiſpenſable rules of art have preſcribed.—In this art, as in others, there are many teachers who profeſs to ſhow the neareſt way to excellence; and many expedients have been invented by which the toil of ſtudy might be ſaved. But let no man be ſeduced to idleneſs by ſpecious promiſes. Excellence is never granted to man, but as the reward of labour." [Plate 23.]

FINIS.

S. Gosnell, Printer,
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